CALFED

DRAFT TECHNICAL REPORT
ENVIRONMENTAL CONSEQUENCES

AGRICULTURAL RESOURCES

Including Agricultural Land Use, Agricultural Economics, and Social Well Being Related to Agriculture

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DRAFT

CALFED
BAY-DELTA
PROGRAM

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LIST OF ACRONYMS

BMP	best management practice
CALFED	CALFED Bay-Delta Program
CCWD	Contra Costa Water District
CEQA	California Environmental Quality Act
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DWR	California Department of Water Resources
EIS	Environmental Impact Statement
EIR	Environmental Impact Report
MAF	million acre-feet
NEPA	National Environmental Policy Act
SWP	State Water Project
TAF	thousand acre-feet

AGRICULTURAL RESOURCES

INTRODUCTION

This report discusses potential impacts on agricultural resources associated with implementing the CALFED Bay-Delta Program (CALFED). Agricultural resources include agricultural land use, agricultural economics, and social well being related to agriculture.

Agricultural Land Use

Activities that could result in potentially significant impacts on agricultural land use include changes in physical land uses or land use designations from construction of new facilities or converting lands from one use to another.

Agricultural Economics

Activities that could result in potentially significant impacts on agricultural economics include charges assessed on agriculture to recover costs of CALFED actions, including charges imposed per acre-foot of water provided by new storage and conveyance, and benefits of reduced uncertainty resulting from resolution of Bay-Delta issues.

Impacts associated with the Ecosystem Restoration Program include costs of installing or replacing fish screens, fish ladders, and other devices; converting agricultural land for habitat; and idling land due to purchase of water for instream flow. Impacts could be associated with shifting agricultural production from directly affected lands to other regions of the state.

For the Water Quality Program, Including Watershed Management Coordination impacts would include costs associated with implementing best management practices (BMPs) to control water quality and benefits to downstream agricultural users of lower salinity or other parameters in upstream return flows. Potential impacts of upper watershed programs include direct footprint impacts in the upper watershed and indirect impacts downstream due to changes in water quality or timing of flow. Both categories of impacts could be potentially significant. Indirect impacts due to water quality changes likely would be positive, while changes in flow timing may be positive or negative. Removal of land from productive use in the upper watershed likely would have a negative impact on agricultural income and public finances, and result in foregone economic opportunities.

Implementation of CALFED upper watershed activities could cause changes in agricultural land uses and in the use, price, quality, and availability of water. These changes could affect production, and investment decisions. In turn, this could change the demand for goods and services, thereby, affecting employment, income generation, and spending patterns.

Impacts associated with the Levee System Integrity Program include reduced risk of inundation of lands directly protected by levees and reduced risk of salinity intrusion into water delivery systems. This program would involve converting agricultural lands to floodways, setback levees, or other flood control uses.

Impacts associated with the Water Use Efficiency Program include costs associated with meeting water use efficiency goals or BMPs. Reduced percolation (recharge) to groundwater and surface water return flows could adversely affect third-party water users; reduction of irrecoverable losses could provide water for other uses. Shifting to pressurized irrigation could induce greater groundwater use because groundwater would be available on demand and free of silt and debris that can clog emitters. Some evidence exists that yields could improve with more careful and efficient water management. Facilitating water transfers could

provide large financial benefits to both willing buyers and willing sellers but could cause potentially significant impacts on agricultural labor and suppliers. If groundwater was pumped to replace surface water sold, long-term impacts on groundwater levels and quality could be potentially significant. If pumping occurred in hydraulic connection with a surface stream, streamflow could be reduced.

Storage and Conveyance would involve converting agricultural lands needed to build storage and conveyance structures, and changes in the quantity or reliability of water available for agricultural use.

Social Well Being Related to Agricultural Resources

Social well-being, for purposes of this analysis, is measured in terms of community stability. Community stability is measured by several economic indicators. Economic indicators include median and per capita income, poverty rates, and unemployment. Adverse impacts to community stability could result from changes to any of these indicators that substantially exceed historical fluctuations.

ASSESSMENT METHODS

Agricultural Land Use

Agricultural land use impacts could occur in two main categories: direct and construction-related impacts; and indirect and operational impacts.

Direct impacts are those changes in physical land uses, or in land use designations, which result from construction of new facilities or conversion of lands from one use to another. For purposes of this analysis, direct impacts are those that would occur if any of alternatives, or combinations of alternatives, were implemented.

Indirect effects occur later in time and further removed in distance. Indirect land use effects would be changes in broad land use policies, resources, or economies which could result from changes in land uses, or in the long-term availability of water resources. Potential indirect and operational impacts of the program include long-term changes in the number of acres in agricultural use.

The important relationships between agricultural, open space/habitat, and developed land uses must be considered when evaluating potential land use impacts for the various program alternatives. For example, an area in agricultural use includes more than the cultivated crop area. Agricultural land uses also include all the ancillary structures and related uses to support agricultural production. These can include, but are not limited to, related residential structures, support structures such as barns and out buildings, the regional roadway infrastructure, and the landowner's water storage and distribution system. Therefore, the loss of agricultural land in a given area might be accompanied by the loss of one or more residences, accessory structures, or access roads used to support the agricultural land use. Similarly, the response of landowners and water resource managers to changes in water supply conditions, economic conditions, and land and water management policies might result in changes in land uses between agricultural, open space/habitat, and developed uses. These types of relationships were assumed throughout the analysis as a basis for determining the potential significance of various types of land use impacts.

This assessment does not provide site-specific details or specific estimates of acreages potentially affected for a given alternative. Rather, potential increases or decreases in agricultural and uses by region is qualitatively estimated.

Agricultural Economics

Assessment variables for agricultural economic impacts are irrigated acres, agricultural water

and land use, water quality, costs and revenues from agricultural production, and risk and uncertainty. Potential impacts are quantified based on existing estimates of land and water value, crop revenue per acre, and costs. Each configuration (e.g., 1A, 1B) is evaluated as part of an alternative. All of the potential impacts described are based on review of and experience with other studies.

Estimates of water supply changes, land conversion, and costs are made using existing policy-level models, such as the Central Valley Production Model, and by interpolating or extrapolating estimates made in other studies.

Impacts of water quality changes on agriculture may be caused by changes in the salinity of water used for irrigation, measured as total dissolved solids (TDS). Potential impacts could arise because of reduced yields of salt-sensitive crops, additional water application and management costs due to salinity, or foregone revenue due to restricted crop selection. Specific constituents of the TDS, such as chloride, sodium, and trace elements, also can be important for certain crops and for livestock.

For this analysis, TDS is used as the indicator of potential changes in water quality for agriculture. The primary components of CALFED that could affect the TDS of water delivered for agricultural use include:

- Flows associated with the Ecosystem Restoration Program,
- Storage and conveyance components, and
- BMPs or other components of the Water Quality Program.

The analysis below is based on the currently available hydrology and water quality analysis, and accounts only for water quality changes due to water supply, conveyance, and operations changes. It does not incorporate any possibly beneficial impacts from the Water Quality Program and may not fully account for flow impacts of the Ecosystem Restoration Program.

Changes in water quality are modeled for a number of scenarios that correspond to various CALFED alternatives. Key measurement points in the Delta are used to indicate the TDS of water diverted for irrigation. TDS (measured in ppm) is converted into electrical conductivity (EC) measured as millimhos per centimeter, using the approximation that 1 mmho/cm equals about 640 ppm.

Potential impacts on crop yield are based on the standard Maas-Hoffman (MH) salinity threshold relationships. For a given crop, the MH relationship defines the soil water salinity at which crop yield begins to be affected, and shows the estimated rate at which yield declines as soil salinity increases beyond the threshold. Table 1 shows the threshold and rate of decline due to salinity for major categories of crops grown in the Delta.

Soil salinity is measured as the EC of the soil saturation extract, which depends on the salinity of applied irrigation water, the leaching fraction, and drainage conditions. With good drainage, the relationship between the salinity of the soil saturation extract and the applied water is roughly linear. To maintain soil salinity at the same EC as applied water would require a leaching fraction of around 35%. At more typical leaching rates of 15%, average soil salinity is about 1.5 times the applied water salinity. With poor drainage, where the salts concentrate in shallow groundwater and in the root zone, the soil can become much saltier than the irrigation water.

CALFED alternatives are expected to change the quality of water delivered for agricultural use in the Delta Region and in parts of the San Joaquin River Region using water exported from the Delta. Table 2 displays the results of water quality modeling of the No Action Alternative and the different configurations of the three CALFED alternatives. Results are shown at three key locations in the Delta:

- Tracy Pumping Plant Intake is used to indicate the salinity of water exported to farmers in the San Joaquin River Region.

Crop Category	Irrigated Acres (1,000 acres)	Threshold Salinity Level (Ece)	Percent Yield Decrease From the Threshold (%)
Pasture	37	5.0	10.0%
Rice	11	3.0	12.0%
Truck Crops	28	1.5	14.0%
Tomatoes	45	2.5	9.9%
Alfalfa	65	2.0	7.3%
Sugar Beets	15	7.0	5.9%
Field Crops	151	1.7	15.0%
Orchards	61	1.5	12.0%
Grains	60	6.0	7.1%
Grapes	36	1.5	19.0%

NOTE:

The salinity of the soil saturation extract is expressed as Ece, which is the electrical conductivity (in mmho/cm).

SOURCES:
1. Irrigated acreage: CALFED 1998a.
2. Maas-Hoffman coefficients: United Nations 1976.

Table 1. Major Crops in the Delta Region and Corresponding Maas-Hoffman Coefficients

- Old River at Middle River is used to indicate salinity of irrigation water in the south Delta.
- Prisoner's Point is used to indicate salinity of irrigation water in the middle Delta.

Potential impacts of water quality changes are evaluated by:

- Using results of the water quality modeling to estimate the change in applied water quality at each location,
- Converting applied water quality to likely salinity of soil saturation extract, and
- Using the MH relationships to judge whether any of the crops grown in the region would likely be adversely or beneficially affected by the water quality change.

Social Well Being Related to Agricultural Resources

Social well-being, for purposes of this analysis, is measured in terms of community stability. Community stability is a measure of a communities' ability to absorb social and economic changes that may result from a proposed action such as the CALFED action. Assessment of community stability is based on changes in economic and social indicators that may occur as a result of a CALFED action. These indicators include median family income, per capita income, poverty rates and unemployment rates.

Selected Locations	In Total Dissolved Solids (TDS, in ppm)											
	No Action, 1A, 1B			Alternative 1C			Alternative 2B			Alternative 2D		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	109	139	207	112	148	206	106	123	137	106	124	141
Delta Export Pumps	217	278	366	185	235	356	175	193	216	163	191	215
South Delta	282	331	389	226	320	395	221	318	395	247	326	395
Selected Locations	Alternative 2E			Alternative 3A			Alternative 3B			Alternative 3D, 3E, 3H, 3I		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	104	121	135	132	185	254	134	186	254	179	240	270
Delta Export Pumps	164	190	214	112	149	185	112	143	176	100	127	177
South Delta	248	326	395	310	373	448	328	378	448	301	346	395

Selected Locations	In Electrical Conductivity (EC, in mmho/cm)											
	No Action, 1A, 1B			Alternative 1C			Alternative 2B			Alternative 2D		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	0.17	0.22	0.32	0.18	0.23	0.32	0.17	0.19	0.21	0.17	0.19	0.22
Delta Export Pumps	0.34	0.43	0.57	0.29	0.37	0.56	0.27	0.30	0.34	0.25	0.30	0.34
South Delta	0.44	0.52	0.61	0.35	0.50	0.62	0.35	0.50	0.62	0.39	0.51	0.62
Selected Locations	Alternative 2E			Alternative 3A			Alternative 3B			Alternative 3E, 3H, 3I		
	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High
Middle Delta	0.16	0.19	0.21	0.21	0.29	0.40	0.21	0.29	0.40	0.28	0.37	0.42
Delta Export Pumps	0.26	0.30	0.33	0.18	0.23	0.29	0.18	0.22	0.28	0.16	0.20	0.28
South Delta	0.39	0.51	0.62	0.48	0.58	0.70	0.51	0.59	0.70	0.47	0.54	0.62

NOTES:

1. EC= TDS/640 is used to convert TDS into EC.
2. Data for Alternative 2A are not available.
3. Middle Delta location is Prisoner's Point; South Delta location is Old River at Middle River. Tracy Pumping Plant is export location.

Table 2. Estimated Salinity of Irrigation Water in Selected Locations, by Alternative (during Irrigation Season: April to September)

Predicting the human behavior that could result from CALFED actions is a difficult task. Past studies of community stability and social conditions related to water supply projects have focused on social, economic, and land use changes resulting from short-term drought conditions. The actual effects of implementation of long-term water supply programs cannot be predicted with complete assurance, but must be projected based on assumptions of human behavior, primarily the assumed actions of farm managers and land owners implementing long-term changes to farm operations. This analysis is based on the regional economics analysis and projected changes to regional employment. These findings have been applied to the analysis for farmers, farm workers, and agribusiness.

SIGNIFICANCE CRITERIA

Agricultural Land Use

The following impacts would have potentially significant agricultural land or water use effects:

- Permanent or long-term reduction in agricultural acreage within a region or the conversion of any lands categorized as prime or unique farmlands;
- Affects an agricultural resource or operation (for example, impacts to soils or farmlands, or impacts from incompatible land uses);
- Any increase in groundwater pumping that would cause or exacerbate overdraft of a basin;
- Changes in surface water use which lead to changes in land use or higher regional unemployment;
- Inconsistency with agricultural objectives of local, regional, and state plans;
- Conflicts with applicable environmental plans or policies adopted by agencies with jurisdiction over the project; or
- Conflicts with general plan designations or zoning.

Agricultural Economics

Criteria used to judge whether an impact is potentially significant to agricultural resources are described below. Significance criteria are applied only to adverse impacts.

- Permanent or long-term reduction in acres of irrigated land within a region would be considered significant.
- A change in water quality that would reduce crop yields.
- Changes in costs or revenues which change the economics of farming to an extent that land use, water use, and employment could be affected would be considered significant.

Social Well Being Related to Agriculture

For purposes of this analysis, socioeconomic effects are measured in terms of adverse changes in community stability. Community stability is measured by several economic indicators. Economic indicators include median and per capita income, poverty rates, and unemployment. Adverse impacts to community stability could result from changes to any of these indicators that substantially exceed historical fluctuations.

Environmental justice impacts were considered potentially significant if a CALFED action would result in a disproportionate distribution of environmental or health impacts to people of a particular minority racial background or low-income group.

ENVIRONMENTAL CONSEQUENCES

Comparison of No Action Alternative to Existing Conditions

ALL REGIONS

AGRICULTURAL LAND USE

The key changes between current conditions and No Action conditions involve agricultural land uses to accommodate facilities associated with reasonably foreseeable future actions in the Central Valley. Additional agricultural impacts are anticipated from urbanization of agricultural lands as Central Valley towns and cities grown in population. Specific agricultural land use impacts (versus impacts to open space or municipal and industrial lands) would depend upon the actual location of the modifications and improvements to be implemented under the No Action Alternative.

AGRICULTURAL ECONOMICS

The predominant changes between existing conditions and future conditions under the No Action Alternative that would affect agricultural production are: changes in the markets for agricultural products, the supply and reliability of irrigation water, the development of water transfer markets, and the cost of water.

- **Changes in Agricultural Markets**: According to estimates in the California Department of Water Resources' (DWR's) Bulletin 160-93 (DWR 1994), future market conditions for California agricultural products will reflect a continuation of current trends. Increasing demand for fruits and vegetables will result in a shift toward production of these commodities and away from field crops and grains. Table 3 compares the existing condition mix of crops in the three Central Valley regions with the projections for 2020 in DWR's Bulletin 160-93. Similar trends are projected for agricultural regions outside the Central Valley.

- **Irrigation Water Supply**: Several important changes have occurred to water supply conditions for agriculture. The CVPIA reallocates up to 800,000 AF of CVP water per year away from agricultural use for environmental restoration. Likewise, the 1994 Bay-Delta Accord reduces the amount of water pumped from the Delta and delivered for agricultural and municipal uses.

Table 4 summarizes the agricultural water use in the Central Valley before and after water was reallocated according to the CVPIA. This table illustrates how changes in surface water delivery correspond to changes in groundwater pumping. The estimates indicate that part of any change in surface water delivery is likely to be offset by a change in groundwater use. The degree of replacement depends on the relative cost of groundwater and surface water, and on the relative cost and benefit of other potential adjustments (for example, changing the amount of acreage irrigated or changing irrigation methods). Estimates of the impact on net agricultural revenues of the CVPIA range from a net gain of $2 million to a loss of $68 million. Because the CVPIA preferred alternative has not been selected, the net economic effect is uncertain.

- **Water Quality**: Reasonably foreseeable changes in water management are expected to affect water quality, thereby impact agricultural yields. As shown in Table 2, the expected TDS range is between 109 ppm to 389 ppm or between an EC or 0.17 to 0.61 mmho/cm.

Crop	Delta Region		Sacramento River Region		San Joaquin River Region	
	Existing Conditions	No Action Alternative (2020)	Existing Conditions	No Action Alternative (2020)	Existing Conditions	No Action Alternative (2020)
Pasture	25.1	24.5	188.4	162.3	183.8	132.4
Alfalfa	44.1	43.7	105.9	96.7	427.4	342.4
Sugar beets	28.6	28.6	78.2	69.6	57.3	42.8
Other field crops	114.8	114.8	207.4	224.0	366.3	369.4
Rice	0.9	0.9	473.1	472.1	18.7	13.5
Truck crops	46.0	46.0	45.3	84.4	368.3	490.7
Tomatoes	42.4	42.4	118.3	130.1	145.8	127.7
Deciduous orchards	21.3	21.3	313.9	346.7	692.4	715.7
Grains	96.7	96.8	282.0	232.9	236.7	210.6
Grapes	5.8	5.8	29.7	37.4	539.1	517.0
Cotton	0.0	0.0	0.0	0.0	1062.5	1082.1
Subtropical orchards	0.0000	0.0000	14.2	13.7	198.9	199
Total	**426**	**424.8**	**1,856.3**	**1,869.8**	**4,297.2**	**4,243.3**

NOTES:

Values are in thousands of acres.

Acreages are based on estimates from the Draft Programmatic Environmental Impact Statement (PEIS) of the CVPIA (U.S. Bureau of Reclamation 1997). Existing conditions estimates assume that the Bay-Delta Accord is in place. No Action Alternative estimates are for Alternative 1 of the CVPIA PEIS.

SOURCE:
U.S. Bureau of Reclamation 1997.

Table 3. Irrigated Acres in the Central Valley for Existing Conditions and the No Action Alternative

Source	Agricultural Water Use — 2020 Condition Without CVPIA (TAF/year)	Change due to CVPIA Dedicated Water for Restoration (TAF/year)
Sacramento River Region		
Surface water	4,524	-39
Groundwater	2,603	25
Total applied	7,127	-14
San Joaquin River Region		
Surface water	4,453	-302
Groundwater	3,427	134
Total applied	7,880	-168

NOTES:

TAF = Thousand acre-feet.

These estimates were based on regions defined in the CVPIA Programmatic Environmental Impact Statement (PEIS) and are shown as an example, based on estimates for the PEIS Alternative 1.

Table 4. Substitution of Groundwater for Surface Water in the Central Valley—Before and After CVPIA Reallocation of Water

- **Water Transfers**: It is widely held that water transfers will play an increasing role in future allocation and use of water. The CVPIA and a number of state laws have increased the likelihood of transfers in the future. Because of the uncertainty and speculation involved, water transfers were not assessed for this description of the No Action Alternative. The Programmatic Environmental Impact Statement (EIS) for the CVPIA describes a potential scenario for movements and prices of water in a transfer market under conditions similar to the No Action Alternative.

- **Cost of Water**: Implementation of cost-of-service and tiered water pricing, plus the restoration charges and surcharges imposed by the CVPIA, will increase the cost of water by up to 100% in some CVP service areas. Districts looking for water to transfer are almost certain to spend more for that water than in the past.

SOCIAL WELL BEING RELATED TO AGRICULTURE

Future agricultural social conditions under the No Action Alternative are expected to be similar to existing conditions. Key factors that would affect farmers in the No Action Alternative include changes in the markets for agricultural products, the supply and reliability of irrigation water, the development of water transfer markets, and the cost of water. Increasing demand for fruits and vegetables is expected to result in a shift toward production of these commodities and away from field crops and grains. Decreases in water availability due to the CVPIA and the Bay-Delta Accord are likely to be made up with groundwater supplies; depending on the size of the deficit, however, groundwater may not be able to completely compensate.

The number of agricultural jobs available may increase in some areas due to projected changes in crop production to higher value and more labor-intensive crops. This would affect farm

workers and agribusiness. Agricultural employment would remain seasonal. Mechanization for picking and sorting crops could improve, and other improvements could eliminate, some tasks that currently are labor intensive. Changes in irrigation technology also may occur that could change farm labor needs. Changes to the population, crop production, and technology resulting in a decrease in employment opportunities or the duration of employment may create an increased need for social services to provide food, health care, and housing for those facing economic hardship. These needs may be seasonal or year-round, depending on the extent of the change and the education, training, and technical skills of the population in the area affected.

DELTA AND BAY REGIONS

AGRICULTURAL LAND USE

The CVPIA Project and the Los Vaqueros Reservoir Project could affect agricultural land use in the Delta and Bay regions. Potentially significant adverse land use impacts associated with the CVPIA Project include converting existing agricultural or other uses to dedicated fish and wildlife uses. The Los Vaqueros Reservoir is under construction and expected to be operational in 1997. Potentially significant adverse land use impacts include converting existing open space or other uses in the Delta Region to reservoir uses.

AGRICULTURAL ECONOMICS

Upper watershed areas essentially encompass the entire drainage basin of the Sacramento River and San Joaquin River watersheds. For this report, impacts of the No Action Alternative on agricultural economic resources of the Delta Region are addressed under the Sacramento River and San Joaquin River regions.

Under No Action Alternative conditions in the Delta and Bay regions, existing conditions generally would continue. Little change in crop mix or total irrigated acreage is expected. Some acreage may be lost temporarily due to levee failure. Depending on repair and reclamation costs, some of this land could be lost permanently. Delta water quality may decline compared to existing conditions. imposing additional costs on Delta agriculture.

SACRAMENTO RIVER REGION

AGRICULTURAL LAND USE

Projects located in the Sacramento River Region, or that could affect land uses in the region, are the CVPIA Project, the Interim Re-Operation of Folsom Reservoir, the Sacramento River Flood Control System Evaluation, and the Stone Lakes National Wildlife Refuge (NWR).

Potentially significant land use impacts of the CVPIA Project are discussed above for the Delta Region. Operation of Folsom Reservoir was modified beginning in 1994. Interim re-operation of Folsom Reservoir would dedicate more storage space to flood control. Converting land uses to flood control uses could significantly affect agricultural land uses in the region.

Phases II and III of the Sacramento River Flood Control System Evaluation are under construction. Potentially significant adverse land use impacts include loss of agricultural and open space uses to accommodate flood control facilities. For the Stone Lakes NWR, land acquisition and restoration activities are underway. Converting land uses to open space uses could significantly affect agricultural land uses in the region.

AGRICULTURAL ECONOMICS

Based on projections provided in DWR's Bulletin 160-93 (DWR 1994), acreage of pasture, hay, and grains will decline; and acreage of orchards and truck crops will increase. Overall irrigated acreage will remain similar to existing conditions. These trends are illustrated in Table 1. Implementation of the CVPIA has reduced surface water delivery and

increased costs in some parts of the Sacramento River Region for existing conditions and the No Action Alternative.

Changes to agriculture in the upper watershed are expected to be minor under the No Action Alternative for the Sacramento River and San Joaquin River regions. Urban encroachment in foothill areas and near highways would continue in these regions.

SAN JOAQUIN RIVER REGION

AGRICULTURAL LAND USE

Projects located in the San Joaquin River Region, or potentially affecting land uses in the region, include the CVPIA Project, the Monterey Agreement, and the New Melones Conveyance Project. Potentially significant land use impacts of the CVPIA Project are discussed above for the Delta Region. The Monterey Agreement was implemented in 1995; potential land use impacts could result from changes in the availability of water for various land uses. These impacts, however, are not anticipated to be significant. The New Melones Conveyance Project conveys water to the Stockton East Water District and Central San Joaquin Water Conservation District for use near and within Stockton. Because the project was constructed recently and is operational, no new significant adverse land use impacts are anticipated.

In addition, under the No Action Alternative, it is estimated that about 45,000 acres of drainage problem lands in the San Joaquin River Region will be retired by year 2020.

AGRICULTURAL ECONOMICS

Irrigated acreage would decline slightly, with orchards and truck crops increasing, and pasture and hay declining. Overall crop trends for existing conditions and the No Action Alternative are shown in Table 1. These trends would result in a gradual rise in crop revenue per acre over time. Implementation of the CVPIA has significantly reduced surface water delivery and increased costs in the parts of the San Joaquin River Region supplied by CVP water, as shown in Table 2. Additional salinity of water diverted from the Delta could impose additional salt management costs.

CVP AND SWP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY

AGRICULTURAL LAND USE

Projects located in SWP and CVP Service Areas or potentially affecting land uses in the region, are the CVPIA Project, the Monterey Agreement, the Coastal Aqueduct Project, the Kern Water Bank Project, the Metropolitan Water District (MWD) Eastside Reservoir Project, and the Semitropic Water Storage District Groundwater Banking Project.

Potentially significant land use impacts of the CVPIA Project and Monterey Agreement are discussed above for the Delta Region and the San Joaquin River Region, respectively.

The Coastal Branch II of the Coastal Aqueduct Project will provide SWP water for manufacturing and industrial use in San Luis Obispo and Santa Barbara counties. Construction began in 1993 on Coastal Branch II, and the project is expected to be operational in 1997. Potentially significant adverse land use impacts include loss of agricultural and open space uses to accommodate conveyance facilities.

The Kern Water Bank Project will develop storage capacity to augment the SWP's dependable supply. Components addressed in this study include only those aspects that have been completed recently and currently are being operated. Converting land uses for storage capacity could result in significant adverse land use impacts.

MWD's Eastside Reservoir project will provide emergency storage following earthquakes and supplies during droughts, and will assist in

meeting peak summer demands. The project is under construction. Converting land uses for storage capacity could significantly affect land uses in the region.

The Semitropic Water Storage District Groundwater Banking project will allow MWD to recharge and extract SWP water in the Semitropic Water Storage District. No significant land use impacts are anticipated.

AGRICULTURAL ECONOMICS

Agricultural acreage in the CVP and SWP Service Areas Outside the Central Valley would decline primarily due to urbanization. According to DWR's Bulletin 160-93 (DWR 1994), more than 100,000 acres of agricultural land in Southern California will be lost between 1990 and 2020. The amount of agricultural land served only by SWP water is relatively small.

Comparison of CALFED Alternatives to No Action Alternative

ALL REGIONS

Table 5 provides a summary of potential impacts on agricultural land in production for all regions by Configurations. Table 6 presents potential impacts on agricultural water use for all regions by Configurations. Table 7 provides a summary of potential impacts on agricultural revenues and costs by region by Configurations. These impacts are discussed in region-specific discussions that follow.

DELTA REGION

Table 8 provides a summary of impacts on agricultural resources in the Delta Region.

ALL ALTERNATIVES

Ecosystem Restoration Program

The character of impacts associated with the Ecosystem Restoration Program would be the same for all alternatives; however, the magnitude would vary by region according to the number of acres of agricultural or other lands converted for restoration.

Agricultural Land Use

The ecosystem restoration program recommends conversion of land in the Delta Region to habitat and ecosystem restoration, levee setbacks, and floodways. In general, agriculture is the dominant land use on the non-conveyance side of levee structures in the Delta. The ecosystem restoration program could convert up to 115,000 acres of important farmland. Some of these agricultural uses may be shifted to the Central Valley or elsewhere.

The mix of crops taken out of production and converted to habitat is difficult to assess because the specific locations where willing seller land acquisitions and restoration will occur are still unknown. Consequently, estimating the reduction in applied water is somewhat speculative. However, using a hypothetical example, and assuming a rough average of 4 acre-feet of applied water per acre of land in production and that the maximum potential footprint of 115,000 acres was converted to habitat in the Delta, about 460,000 acre-feet of applied water would be left in the stream or consumed by the new habitat.

It is important to note that this reduction in agricultural applied water does not equal water potentially available for other beneficial users other than the new habitat. Much of the water applied to Delta lands not consumed by crops returns as flow to the rivers in the Delta. In addition, flora that is restored in the Delta will consume much of the water that would have been used by crops.

Configurations	Delta Region	Bay Region	Sacramento River Region	San Joaquin River Region	SWP and CVP Service Areas Outside the Central Valley
1A, 1B	Farmland converted to other uses.	Similar to No Action, with minor potential shift of crop production from Delta Region.	Farmland converted for habitat uses.	Farmland converted for habitat uses, primarily on east side.	Similar to No Action, with minor potential shift of crop production from Delta Region.
1C	Same as 1A, plus additional farmland converted for conveyance facilities.	Additional water can supply some of the acreage lost to CVP cuts in No Action.	Same as 1A, plus additional farmland conversion for storage and conveyance facilities. Additional delivery could support shift of production from converted lands.	Same as 1A, plus additional farmland conversion for storage and conveyance facilities. Additional delivery could support shift of production from converted lands.	Same as 1A.
2A	Same as 1A, plus additional farmland converted for conveyance.	Similar to 1C.	Similar to 1A.	Similar to 1A.	Same as 1A.
2D	Same as 1A, plus additional farmland converted for conveyance.	Similar to 1C.	Similar to 1A.	Same as 1A, plus additional farmland converted for conveyance.	Same as 1A.
2B, 2E	Same as 1A, plus additional farmland converted for conveyance.	Similar to 1C.	Similar to 1C.	Same as 1A, plus additional farmland converted for conveyance.	Same as 1A.
3A	Same as 1A, plus additional farmland converted.	Similar to 1C.	Similar to 1A.	Similar to 1A.	Same as 1A.
3B, 3E	Same as 1A, plus additional farmland converted.	Similar to 1C.	Similar to 1C.	Similar to 2B.	Same as 1A.
3H	Same as 1A, plus additional farmland converted.	Similar to 1C.	Similar to 1C.	Similar to 2B.	Same as 1A.
3I	Same as 1A, plus additional farmland converted.	Similar to 1C.	Similar to 1C.	Similar to 2B.	Same as 1A.

NOTES:

SWP = Surface Water Project.
CVP = Central Valley Project.

Table 5. Summary of Potential Impacts on Agricultural Land in Production in All Regions

Config-urations	Delta Region	Bay Region	Sacramento River Region	San Joaquin River Region	SWP and CVP Service Areas Outside the Central Valley
1A, 1B	Potential changes due to efficiency and water quality BMPs.	Potential changes due to efficiency and water quality BMPs.	Potential changes due to efficiency and water quality BMPs.	Potential changes due to efficiency and water quality BMPs.	Potential changes due to efficiency and water quality BMPs.
1C	Same as 1A, plus 2,500 acre-feet of new water supply.	Same as 1A. Also, up to 3,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 35,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 167,000 acre-feet of additional average water supply.	Same as 1A.
2A	Same as 1A, plus about 1,000 acre-feet of new water supply	Same as 1A. Also, up to 1,700 acre-feet of additional average water supply.	Same as 1A. Also, up to 10,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 48,000 acre-feet of additional average water supply.	Same as 1A.
2B	Same as 1C.	Same as 1A. Also, up to 3,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 35,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 167,000 acre-feet of additional average water supply.	Same as 1A.
2D	Same as 1A, plus about 1,000 acre-feet of new water supply.	Same as 1A. Also, up to 1,700 acre-feet of additional average water supply.	Same as 1A. Also, up to 18,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 86,000 acre-feet of additional average water supply.	Same as 1A.
2E	Same as 1C.	Same as 1A. Also, up to 3,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 35,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 167,000 acre-feet of additional average water supply.	Same as 1A.
3A	Same as 2A.	Same as 1A. Also, up to 1,400 acre-feet of additional average water supply.	Same as 1A. Also, up to 15,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 73,000 acre-feet of additional average water supply.	Same as 1A.
3B	Same as 1C.	Same as 1A. Also, up to 3,500 acre-feet of additional average water supply.	Same as 1A. Also, up to 37,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 177,000 acre-feet of additional average water supply.	Same as 1A.
3E, 3F, 3G, 3H, 3I	Same as 1C.	Same as 1A. Also, up to 3,500 acre-feet of additional average water supply.	Same as 1A. Also, up to 37,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 177,000 acre-feet of additional average water supply.	Same as 1A.

NOTES:

BMP = Best management practice.
CVP = Central Valley Project.
SWP = Surface Water Project.

Table 6. Summary of Potential Impacts on Agricultural Water Use in All Regions

Configurations	Delta Region	Bay Region	Sacramento River Region	San Joaquin River Region	SWP and CVP Service Areas Outside the Central Valley
1A, 1B	Large revenue losses from land conversion. Potential cost increases for BMPs. Potential yield and revenue increases from improved water quality.	Potential cost increases for water use efficiency and water quality BMPs.	Revenue losses from land conversion. Potential cost increases for water use efficiency and water quality BMPs.	Revenue losses from land conversion. Potential cost increases for water use efficiency and water quality BMPs.	Potential cost increases for water use efficiency and water quality BMPs.
1C	Same as 1A.	Potential cost increases for BMPs. New water supply could support increased production, but is potentially very costly.	Same as 1A. Also, new water supply could support increased production, but is potentially very costly.	Same as 1A. Also, new water supply could support increased production, but is potentially very costly.	Same as 1A.
2A, 2B, 2D, 2E	Same as 1A.	Similar to 1C.	Similar to 1C.	Similar to 1C.	Same as 1A.
3A, 3B, 3E, 3H, 3I	Same as 1A.	Similar to 1C.	Similar to 1C.	Similar to 1C.	Same as 1A.

NOTES:

BMP = Best management practice.
CVP = Central Valley Project.
SWP = Surface Water Project.

Table 7. Summary of Potential Impacts on Agricultural Revenues and Costs in All Regions

Assessment Variable	Existing Conditions	Configurations								
		No Action	Alternative 1		Alternative 2		Alternative 3			
			1A, 1B	1C	2A, 2D	2B, 2E	3A	3B, 3E	3H	3I
Irrigated acres	509,000 irrigated acres.	Potential permanent loss of land to levee failure.	Farmland converted to other uses.	Same as 1A.	Same as 1A, plus additional farmland converted.	Same as 2A, except 2E could convert more farmland for conveyance.	Same as 1A, plus additional farmland converted.	Same as 1A, plus additional farmland converted.	Same as 1A, plus additional farmland converted.	Same as 1A, plus additional farmland converted.
Agricultural water use	1.2 MAF of surface water. 110,000 acre-feet groundwater.	Similar to existing conditions.	Potential changes due to efficiency and water quality BMPs.	Same as 1A, plus 2,500 acre-feet of new water supply.	Same as 1A, plus about 1,000 acre-feet of new water supply.	Same as 1C.	Same as 2A.	Same as 1C.	Same as 1C.	Same as 1C.
Agricultural production costs and revenues	$630 million in crop revenue.	Similar to existing conditions.	Large revenue losses from land conversion. Potential cost increases for BMPs. Potential yield and revenue increases from improved water quality.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.
Risk and uncertainty	High risk of levee failure.	Similar to existing conditions.	Reduced risk of levee failure and flooding. Higher costs can increase financial risk.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.

NOTES:

MAF = Million acre-feet.
BMP = Best management practice.

Table 8. Summary of Potential Impacts in the Delta Region

Agricultural Economics

Direct impacts of this program would be felt most in the Delta Region where agricultural lands would be taken out of production. The crops that would be removed from production could range from a mix of field and forage crops (corn, grain, and pasture) to high-value orchards. A typical average crop revenue associated with field and forage crops is about $500 per acre per year. The average crop revenue associated with vegetables and orchards is about $1,000 per acre per year. Using this range of potential revenue loss, the annual reduction in gross revenue from production would be between $50 and $135 million. The agricultural land would be purchased at a negotiated fair market value to reduce economic hardship on local farmers.

Because the market demand for the crops grown on this land still would exist, some acreage probably would be shifted to other regions in the Central Valley or elsewhere. Under Configurations 1A and 1B, no new sources of water would be developed for agriculture; therefore, the crops shifted to other areas of the state could increase the use and overdraft of groundwater. Configuration 1C could provide up to 200,000 acre-feet per year of water for agriculture, on average. Assuming that the cost of this water was affordable for crop production, it could be used to irrigate crops shifted because of Delta land conversion.

Loss of farmland may adversely affect the financial viability of local agencies, especially water and reclamation districts. Reduced acreage and higher production costs in other regions would result in increased prices to consumers.

The amount of the increase depends on the market conditions for each crop. Additional costs of installing or replacing screens on Delta diversions may be borne by agricultural water users.

Social Well Being Related to Agriculture

Implementation of ecosystem restoration in the Delta would result in the conversion of agricultural lands to restored habitat. In Alternative 1 this conversion would result in changes in the number of jobs for farmers, farm workers and agribusiness. This job loss would be a potentially significant adverse impact depending on the magnitude of the job loss and extent of mitigation efforts.

The most significant impact would be the concentrated loss of jobs for farm workers who tend to have limited skills. Stress may be put on existing social services, such as welfare and job training, to help provide transitions for displaced farm workers. Because the Delta Region is already experiencing high levels of unemployment and the labor force is primarily farm workers, the social and economic structure of these communities could be adversely affected. Examples may include higher demand for social services, increased crime, and loss of local small businesses such that customers may have to travel further to purchase supplies. Less technically skilled workers and those lacking basic education levels and English language skills may have more difficulty finding new employment.

Per capita income for displaced farmers and families may decline and could be mitigated by social service and support programs, such as welfare and job training. Farm managers may be required to travel further to their place of employment or move to other areas to gain employment. The need to move or to be away from home and family for longer periods, could add additional burden to family members.

It is anticipated that displaced farm managers and technicians could find work in other regions or other jobs related to agriculture. While there may be a temporary increase in the need for social services to provide training or economic assistance for a portion of these displaced workers, this need would not be expected to be significant.

Water Quality Program, Including Coordinated Watershed Management

Agricultural Land Use

The Water Quality Program focuses on source control and reducing the release of pollutants into the Bay-Delta system and its tributaries. The program is not anticipated to result in direct or indirect land use impacts in any CALFED region.

Agricultural Economics

The Water Quality Program may implement BMPs that regulate the quantity or quality of discharged drainage from agricultural lands. Impacts would vary depending on the structure of water quality control programs (for example, whether BMPs were required or voluntary or whether financial incentives such as cost-sharing and technical assistance were provided). BMPs could include practices such as reuse of surface drain water, percolation and subsurface drainage control, recycling, treatment, and controlled discharge of drainage. Control of upstream drain water quality and quantity from this program could reduce salinity of water diverted to the Delta for irrigation. Effective reduction in salinity of water entering the Delta and delivered to agriculture would be a potential benefit. Lower salinity reduces the costs of managing salt accumulation, can improve crop yield, and can allow a wider selection of crops.

Costs of implementing BMPs to improve discharge from Delta cropland could affect Delta agriculture and lead to potentially significant changes in water or land use patterns. Water quality BMPs, if applied to Delta agriculture, could raise production costs.

Impacts of water quality changes on agriculture may be caused by changes in the salinity of water used for irrigation, measured as TDS. Potential impacts could arise because of reduced yields of salt-sensitive crops, additional water application and management costs due to salinity, or foregone revenue due to restricted crop selection. Several components of the CALFED program could affect the TDS of water delivered for agricultural use, including flows associated with the ERP, storage and conveyance components, and BMPs or other components of the Water Quality Program.

In the middle Delta, irrigation water quality under all alternatives averages between 121 and 240 ppm, which converts to an EC range of 0.22 to 0.37 mmho/cm (Table 4). The average EC during the months of highest salinity ranges from 0.21 to 0.42. The most sensitive vegetable crops begin to experience salinity effects at 1.0 EC. Therefore, no significant positive or negative impact is expected from water quality changes in the middle Delta.

TDS in the south Delta is substantially higher than in the middle Delta. As shown for the Old River at Middle River location in Table 4, average water quality ranges from 318 to 378 ppm, depending on the alternative. This converts to a soil salinity of 0.75 to 0.88, assuming an effective leaching of 15%. During months of the poorest water quality, salinity of applied water can be 450 ppm. This level of salinity approaches the yield threshold for several salt sensitive truck crops, including beans and strawberries, and some care in water management is required to avoid yield losses. However, none of the alternatives show any significant change in salinity compared to the No Action Alternative, therefore no significant positive or negative impacts are apparent.

Social Well Being Related to Agriculture

Implementation of the Water Quality Program could affect the cost of doing agricultural business in the Delta Region by lowering costs due to improved water supply from reduced salinity or raising costs due to BMP implementation costs, which could positively or adversely affect farmers, respectively. Impacts on farm workers and agribusiness workers would depend on the impact to farmers.

Levee System Integrity Program

Agricultural Land Use

Levee system integrity measures could affect up to 35,000 acres of land in the Delta, most of which would likely be important agricultural land. However, the specific locations of lands that would be affected by the Program are not known at this time. The impacts from this program would primarily affect agricultural land uses in the Delta Region and would not directly affect land uses in the other four regions.

Agricultural Economics

Potential impacts of the Levee System Integrity Program on agriculture in the Delta include:

- Improved reliability of protection from levees that provide reduced risk of flooding to agricultural areas protected.
- Setback levees largely would require purchasing existing agricultural land. Crop acreage and production would decline, with potential impacts similar to those described under the Ecosystem Restoration Program. Annual revenue loss associated with this land could range from $6 to $13 million. Loss of prime farmland is considered a potentially significant impact. The loss of farmland could adversely affect the financial viability of local agencies, especially water and reclamation districts.
- Salinity intrusion that might result from key levee failures could cause extended shutdown of Delta water diversions. Improved levee protection would provide a substantial benefit to Delta farmland by reducing the overall risk of levee failure.

Social Well Being Related to Agriculture

Implementation of the Levee System Integrity Program would require converting some agricultural land in the Delta Region. However, the net effect for farmers should be positive, as improvements to the levee system would afford agriculture greater protection from inundation and salinity intrusion. Some farm worker jobs may be lost from agricultural land converted for levee setbacks.

Water Use Efficiency Program, Including Water Transfers

Agricultural Land Use

Direct construction-related land use impacts are not anticipated for the Water Use Efficiency Program in any region. The program relies on incentives, technical assistance, and policies to be implemented by local agencies, rather than mandatory measures and targets for water use efficiency. Therefore, no direct impacts to agricultural land use is anticipated; however, there may be indirect impacts.

Agricultural land may be removed from production because of increased costs and decreased profitability which could result from required efficiency improvements or increased district water charges (for example, as part of tiered water pricing). Conversely, improved efficiency may allow the continued viability of agriculture in some areas. This will tend to maintain the existing uses of agricultural lands in some regions and reduce the amount that may go out of production or become urbanized. Efficiency improvements that result in greater water supply reliability but also higher annual cost may cause a shift in the types of crops grown. A shift to high-value crops may lead to a hardening of water demand. Conversion or loss of agricultural land would be a potentially significant adverse land use impact of the program. Improvement in the long-term viability of some agricultural lands would be a potential beneficial impact.

The Water Transfer Program is not expected to affect open space or developed land use because the augmented water supply is assumed to replace existing water supplies. In addition to the source of water for a transfer, the timing, magnitude, and pathway of each transfer have a tremendous effect on the potential for significant impacts. The water source varies according to the water transfer category: crop

fallowing (surface water or groundwater), shifting to a crop with a lower water demand (surface water or groundwater), groundwater substitution for surface water (surface water), direct groundwater transfers (groundwater), conserved water (surface water or groundwater), and stored water in reservoirs (surface water).

Potential significant beneficial impacts are associated with the transferred water's destination, and include: 1) increasing agricultural acreage in areas with limited water supplies; and 2) increasing habitat acreage in areas with limited water supplies.

Potential significant adverse impacts are associated with the transferred water's origin, and include: 1) decreasing agricultural acreage due to crop fallowing; 2) decreasing agricultural acreage due to increased costs resulting from direct groundwater or groundwater replacement transfers; 3) causing land use changes that could be inconsistent with local agricultural objectives; and 4) decreasing habitat acreage.

Water transfers are not expected to have direct land use impacts; however, they could indirectly affect agricultural opportunities by changing availability of water in selling and receiving areas.

Agricultural Economics

Potential impacts of the Water Use Efficiency Program on agriculture in the Delta are difficult to assess because they depend on the details of program implementation, which largely would occur at the local level. The program would not impose mandatory measures and targets but would rely on incentives and technical assistance. The program includes policies on agricultural water use efficiency and water transfers.

Achieving higher agricultural water use efficiency involves costs at both the farm and district levels. Greater capital investment and more energy use generally is required to deliver and apply water more precisely and on demand. Some evidence exists that yields can improve with more careful and efficient water management. Costs for water and other production inputs also can change. The impact of the Water Use Efficiency Program is uncertain and could range from little or no measurable effect to significant reductions in applied water. Because nearly all the return flow from Delta irrigation is reusable, net effects on the volume of available water supply would be small. Costs of achieving efficiency increases could range from $35 to $50 per acre-foot of reduced applied water, but over $300 per acre-foot of net savings in consumptive use or irrecoverable loss (that is, "real" water savings).

Lower water use on average could leave some districts and users with more carryover water on average, with some net improvement in water supply reliability. Required BMPs also could result in demand hardening, in which fewer inexpensive management options remain for reducing water use during drought.

The Water Transfer Program would affect agricultural economics primarily through changes to irrigated acreage, agricultural water use, and production costs and revenues. In addition to the source of water for a transfer, the timing, magnitude, and pathway of each transfer have a tremendous effect on the potential for significant impacts. Because transfers can invoke both beneficial and adverse impacts, at times on the same resource, the net environmental effect of a water transfer within and between resources must be considered when determining a transfer's overall effect on the environment.

Potential significant beneficial impacts are primarily associated with the transferred water's destination, and include increasing irrigated acres; decreasing unemployment in the area of use; increasing demand for farm products in the area of use; and increasing demand for crop storage and processing in the area of use. Other potential significant beneficial impacts are associated with the transferred water's origin, and include increasing income from the transfer to farmers or agricultural entities serving as the transferor; and increasing agricultural-related capital improvements to farms from income derived from water transfers.

Potential significant adverse impacts are associated with the transferred water's origin, and include changes to irrigated acreage, water use, and revenue. Water transfers due to crop fallowing and crop shifting can affect farmers, farm workers, and agribusiness, and include reducing irrigated acres due to fallowing; increasing unemployment; reducing demand for farm products, including seed and agricultural chemicals; reducing demand for crop storage and processing; and increased operating costs by increasing groundwater lift.

Due to minimal in-Delta conveyance facility changes, conveyance capacity will continue to be the principle limiting factor to water transfers. The number and magnitude of water transfers will continue to be relatively small, except in critically dry years. The Water Transfer Program will influence only a fraction of Central Valley and Delta flows, generally increasing base flows but not exacerbating high flows. Alternatives 2 and 3 provide better water transfer opportunities than Alternative 1.

Social Well Being Related to Agriculture

During the drought of the early 1990s, many communities faced reduced employment resulting from significant reduction in crop acreage. Farm laborers were left jobless. To the extent that efficiency improvements can help improve water supply reliability, employment opportunities can be maintained. This should contribute to the stability of many local agricultural communities.

Job opportunities could be created by water use efficiency improvements. As irrigation management improves, so must the knowledge of those irrigating or scheduling irrigations. This would result in the need for more skilled labor, but at higher costs. In addition, the design and installation of new or improved on-farm or district water delivery systems would create more jobs for skilled laborers. It is conceivable that efficiency improvements, especially those that involve physical construction would add to local employment.

However, water use efficiency improvements also could have adverse impacts on farm labor. One benefit of improved irrigation efficiency that may be experienced by a farmer is a reduced need for labor, due either to less cultivation or changes in how crops are irrigated. The addition of pressurized irrigation systems would have the most substantial impact. With pressurized irrigation, what used to be the job of several workers, could be replaced by just one. It is estimated that as technology advances, 30 percent less labor would be needed to perform the same amount of work. This means that two out of three farm workers may be employed once efficiency measures are implemented.

Improved efficiencies often translate to higher crop yields and better quality of farm products. Such advances can increase on-farm direct income, benefitting the grower's net income, and translate to additional economic activities. Increased income also can help the overall economy in total sales and purchases, and increase tax revenues that strengthen vital functions such as schools, roads, and social and health services.

Water use efficiency improvements also could result in improved crop yields. Improvements in the yield per acre-foot of applied water, even with possible reduction in water supply, would result in greater production of food and fiber on the same land. As populations continue to increase, not only in the state but in the nation and globally, highly efficient food production will become a greater asset.

Effects from water transfers, as discussed above for Agricultural Land Use, would benefit agricultural communities receiving water but adversely affect community stability in areas transferring the water.

Storage and Conveyance

Impacts from Ecosystem Restoration, Water Quality, Watershed Management Levee Stability, Water Use Efficiency, and Water Transfers are expected to be similar to those discussed above under All Alternatives, Delta Region, unless noted below. Alternative

specific impacts would be primarily related to storage and conveyance actions.

Alternative 1

Agricultural Land Use

Significant and unavoidable adverse land use impacts could occur by converting existing land uses from new or expanded surface storage. Specific land use impacts would depend on the exact location of the new storage facility. For purposes of this programmatic analysis, it is assumed that most new reservoir sites would be located in the foothills rather than in flat, valley-bottom areas where agricultural land uses would occur. Therefore, storage elements would likely affect less productive agricultural lands, such as grazing lands, and not the better farmland generally found on the valley floor.

Creating an open-channel isolated conveyance in Alternative 3 would be a significant adverse land use impact due to permanent conversion of between 4,500 and 33,500 acres of important farmland.

Conversion of prime or unique farmland to other uses could also conflict with local or regional agricultural land use plans or policies, which could be a significant impact.

The specific locations of improvements contemplated for the alternatives have not been identified for this programmatic-level analysis. Thus, the consistency of project alternatives with general plan land use designations or zoning are not evaluated herein. However, inconsistency with these plans could result in a significant adverse land use impact.

The cost and availability of water from new storage and conveyance facilities will depend on the
alternative selected, the location of facilities proposed, and amount of new water from each of these facilities. Neither a cost analysis nor a willingness-to-pay study have been completed. Consequently, the allocation of new water by region is uncertain. However, based on proposed alternative configurations some general statements can be made about potential water supply benefits in each of the regions. No agricultural water supply benefits would accrue to the Delta Region for Configurations 1A and 1B. And the benefits (or losses) to the Delta Region from the other configurations are unknown.

Agricultural Economics

Additional SWP and CVP yield and reliability from storage and conveyance components are not expected to substantially affect the quantity of water available for Delta agriculture. Potentially up to 2,500 acre-feet per year, on average, would be available to CVP service areas in the Delta (primarily Contra Costa Water District [CCWD] and the northernmost districts in the Delta-Mendota Service Area). Based on values estimated for the CVPIA Programmatic EIS, the marginal value of this water for agricultural production would be $40 to $50 per acre-foot. Table 9 shows estimates of additional water available by region.

Configuration 1B would require prime farmland for constructing south Delta facilities. Configuration 1C would convert up to 400 acres of farmland to enlarge Delta channel capacity and for surface and groundwater storage facilities. The loss of farmland may adversely affect the financial viability of local agencies, especially water and reclamation districts. However, the net economic impact would be less than significant.

Social Well Being Related to Agriculture

The extent of impacts would vary due to the variation in water yield and the opportunity to shift agriculture to various parts of the Delta. The alternatives could result in a significant but perhaps mitigable impact to farmers, farm workers, and agribusiness as a result of agricultural land conversion due to the conveyance and in-Delta storage options. This conversion would result in changes in the number of jobs for farmers, farm workers, and agribusiness. The intensity of this adverse impact depends on the magnitude of job loss.

Alternative 2

Agricultural Land Use

Alternative 2 includes significant modifications of through-Delta channels to improve water conveyance across the Delta. Channel widening and island flooding would require converting agricultural and, potentially, other lands. Adverse direct and construction-related land use impacts of the modifications could be significant. There would be substantial in-Delta water conveyance capacity increases under Alternatives 2 and 3. However, under Alternative 3, the isolated transfer facility would provide water transfer opportunities that exceed those under Alternative 2.

Prime and unique farmland could be affected by storage and conveyance components of the Alternative 2 configurations. Loss if this farmland is considered a significant adverse land use impact. Conversion of prime or unique farmland to other uses could also conflict with local or regional agricultural land use plans or policies, which could be a significant impact.

Configuration 2A would convert farmland for conveyance and storage, including flooding the McCormack-Williamson Tract. This would have a significant adverse impact on farmland.

Alternative Variation 2B potentially would implement the same Delta modifications described under Alternative variation 2a, and would add surface and groundwater storage components. Potentially adverse land use impacts of new or expanded surface water storage are discussed under Alternative 1, and could be significant.

Potential significant land use impacts for Configuration 2D would be similar to those for Configuration 2A, with additional adverse impacts related to purchasing and converting agricultural land for open space in the form of floodway, conveyance channel, or habitat. Configuration 2E eliminates certain in-channel conveyance and adds additional habitat from inundating Tyler Island. Land uses converted under Configuration 2E could be a significant adverse impact.

Agricultural Economics

For all variations of Configuration 2, changes in agricultural water use and crop revenue in the Delta would be linked to changes in agricultural acres in production. Reductions in gross and net revenue generally would not be as large as reductions in acreage, because higher revenue crops would be kept in production or shifted to other lands to the extent feasible. Conveyance options would require farmland conversion, producing estimates of crop revenue of between $1.9 and $6.2 million per year. Loss of this land is considered a potentially significant impact. Impacts of water supply increases in the Delta Region would be small, up to levels similar to those described under Alternative 1.

Social Well Being Related to Agriculture

Construction of floodway setbacks and wetlands habitat under Configurations 2D and 2E and of Tyler Island habitat under Configuration 2E would require converting farmland. Impacts have not been quantified, but would be similar in character to those described for the Ecosystem Restoration Program. Impacts on farm workers and agribusiness would depend on impacts on farmers.

Alternative 3

Agricultural Land Use

Potential land use impacts on land uses in the Delta under Alternative 3 are anticipated to be similar to those described under Alternative 1. The main differences between Alternatives 1 and 3 involve the storage and conveyance components.

Alternative Variation	DWRSIM Study	Total Yield Increase (TAF/year)		Agricultural Yield Increase (TAF/year)		Assumed Percentage Delivered by Region				
		Critical	Average	Critical	Average	Delta (1%)	Bay (2%)	Sacramento (17%)	San Joaquin (81%)	Other (0%)
1A	472	0	0	0	0	0.0	0.0	0.0	0.0	0.0
1B	472	0	0	0	0	0.0	0.0	0.0	0.0	0.0
1C	510	751	623	250	207	2.5	3.2	34.6	166.7	0.0
2A	472B	80	180	27	60	0.7	0.9	10.0	48.3	0.0
2B	510	751	623	250	207	2.5	3.2	34.6	166.7	0.0
2D	498	370	320	123	107	1.3	1.7	17.9	86.1	0.0
2E	510	751	623	250	207	2.5	3.2	34.6	166.7	0.0
3A	475	210	270	70	90	1.1	1.4	15.0	72.5	0.0
3B	500	1070	660	356	220	2.6	3.5	36.7	177.2	0.0
3E, 3H, 3I	500	1070	660	356	220	2.6	3.5	36.7	177.2	0.0

NOTES:

TAF = Thousand acre-feet.

Critical refers to the simulated 1928 to 1934 critical drought period. Average refers to the average over the 70-year hydrologic simulation.

Table 9. Assumed Additional Yield Delivered for Irrigation by Region and Configurations

Potential direct land use impacts would be different for an open channel vs. a buried pipeline. Creating an open channel isolated conveyance would be a significant adverse land use impact due to permanently converting underlying land uses from agriculture (primarily) to open space. Constructing a buried pipeline isolated conveyance, however, would be a short-term, temporary adverse impact on surrounding land uses. Any agricultural land uses affected could resume after completing pipeline construction.

Potential impacts for Configuration 3A are similar to Configuration 2A, except for proposed Delta island flooding. An open channel isolated conveyance would require converting agricultural land for the canal and right-of-way. Potential land use impacts would be significantly adverse.

Potential impacts of Configuration 3B are similar to those described for Configuration 3A, except that in-Delta storage would require converting existing agricultural lands. Delta agricultural land use impacts from Configuration 3E are similar to those for Configuration 3B and would be significant.

Land use impacts of Configuration 3H are similar to Configuration 2E, but with more agricultural land purchased for right-of-way for a conveyance canal than for a pipeline. Potential land use impacts would be significantly adverse.

Prime and unique farmland could be affected by the Alternative 3 configurations. Loss of this farmland is considered a significant adverse land use impact. Conversion of prime or unique farmland to other uses could also conflict with local or regional agricultural land use plans or policies, which could be a significant impact.

Agricultural Economics

The major difference between Alternatives 1 and 3 is in the in-Delta storage and conveyance components. Conveyance and storage options would require land conversion of farmland—producing crop revenue of between $2.3 and $21 million per year. The mix of crops removed depends on the location of the storage facilities, and could range from a mix of field and forage crops (corn, grain, and pasture) to high-valued orchards. The agricultural land would be purchased at a negotiated fair market value to reduce economic hardship on local farmers. In-Delta storage would have potential negligible to minor beneficial effects on agricultural production in other parts of the Delta Region, by providing more reliability in flows and deliveries. Impacts of water supply increases within the Delta Region would be small, similar to or less than those described under Alternative 1.

Under Alternative 3, the isolated transfer facility would provide water transfer opportunities that exceed those under Alternative 2. Other impacts would be the same as discussed under Alternative 2.

Social Well Being Related to Agriculture

Construction of the isolated facility under Configurations 3A, 3B, 3E, 3H, and 3I would require converting Delta agricultural land. Impacts on farmers would vary depending on the extent of the conversion. Impacts on farmers, farm workers, and agribusiness workers would be similar to those described for the Ecosystem Restoration Program.

BAY REGION

ALL ALTERNATIVES

Table 10 summarizes impacts on agricultural resources in the Bay Region.

Agricultural Land Use

County general plans in the Bay Region which could be applicable to land use impacts include those of: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma Counties. Principal local plans include those of the cities of: Berkeley, Oakland, San Francisco, and San Jose. The compatibility and consistency of potential actions with county and local land use plans is not evaluated in this programmatic-level analysis. However, inconsistency between applicable Alternative 1 program elements with these plans could result in a significant adverse land use impact.

Potential land use impacts to prime and unique farmland in the Bay Region are anticipated to be minimal and insignificant, and have not been quantified.

It is anticipated that agricultural water users in the Bay Region would receive some of the additional water supply developed by most of the configurations, ranging from about 60,000 to 700,000 acre-feet (annual average).

Agricultural Economics

Impacts for Configurations 1A and 1B from the ecosystem restoration program on agriculture are expected to be minor and similar to No Action conditions. To the extent that they apply to areas non-tributary to the Delta, BMPs under the water quality and water use efficiency programs could substantially increase production costs.

The levee system integrity program would reduce salinity intrusion in the Bay Region, representing a beneficial effect. Because of water supply deficiencies in some agricultural areas, especially the San Felipe Division of the CVP, water transfers may be an important source of water in the future.

Up to about 3,000 acre-feet per year could be available from the storage and conveyance components of Configuration 1C, from 1,000 to 3,000 acre-feet under Alternative 2, and from 1,500 to 3,500 acre-feet per year under

Alternative 3. This water could be available primarily to CCWD, San Felipe Division lands in the south Bay Area, and users served by the North and South Bay aqueducts of the SWP. The marginal value of irrigation water in the Bay Area is high, probably exceeding $100 per acre-foot. Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., crop selection, water use).

Social Well Being Related to Agriculture

Up to 3,200 acre-feet per year of additional water provided in Configuration 1C could result in positive impacts on farmers in the form of the development of additional acreage shifted from the Delta due to land conversion, or changes to higher water use and higher value crops. No significant adverse impacts are anticipated to farmers, farmworkers, or agribusiness.

SACRAMENTO RIVER REGION

Table 11 summarizes impacts on agricultural resources in the Sacramento River Region.

ALL ALTERNATIVES

Ecosystem Restoration Program

Agricultural Land Use

The Ecosystem Restoration Program could convert up to 34,000 acres of important farmland, primarily on the east side of the valley.

Agricultural Economics

This program would convert productive farmland in the Sacramento River Region, primarily on the east side and valley floor. Typical crops grown in these areas include rice, pasture, hay, orchards, and tomatoes. Using $500 to $1,000 per acre per year as a reasonable range of crop revenue, the range of annual revenue that would be lost from crop production would be about $13 to $34 million. This would have a substantial adverse impact on farm revenues, income generation, and employment levels. Loss of farmland may also adversely affect the financial viability of local agencies, especially water and reclamation districts.

Any changes in water supply, such as purchase of water rights for in-stream flow, could result in changes to crop patterns, potentially affecting crop value. Direct impacts to the landowner would not be significant because the transaction would be only with willing sellers. Changes in the quantity or pattern of in-stream flow could affect downstream agricultural users and could potentially be significant.

Social Well Being Related to Agriculture

The Ecosystem Restoration Program could result in conversion or idling of agricultural land in the Sacramento River Region. Impacts on social groups in this region for all alternatives would be similar in character to those described for the Delta Region. The severity of this impact would depend on the magnitude of farm worker job loss and the extent of mitigation efforts.

Water Quality Program, Including Coordinated Watershed Management

Agricultural Land Use

Potential watershed activities in the Sacramento River Region would be compatible with applicable agricultural land use plans and policies in their affected jurisdiction. Reduced grazing activities could also have potential significant land use impacts in this region if they result in a loss of agricultural productivity.

Assessment Variable	Existing Conditions	Configurations						
		No Action	Alternative 1		Alternative 2		Alternative 3	
			1A, 1B	1C	2A, 2D	2B, 2E	3A	3B, 3E, 3H, 3I
Irrigated acres	244,000 irrigated acres.	Similar to existing conditions.	Similar to No Action, with minor potential shift of crop production from Delta Region.	Additional water could supply some of the acreage lost to CVP cuts.	Additional water could supply some of the acreage lost to CVP cuts.	Additional water could supply some of the acreage lost to CVP cuts.	Additional water could supply some of the acreage lost to CVP cuts.	Additional water could supply some of the acreage lost to CVP cuts.
Agricultural water use	190,000 acre-feet per year surface water; 540,000 acre-feet groundwater.	Similar to existing conditions.	Potential changes due to water use efficiency and water quality BMPs.	Same as 1A. Also, up to 3,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 1,700 acre-feet of additional average water supply.	Same as 1A. Also, up to 3,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 1,400 acre-feet of additional average water supply.	Same as 1A. Also, up to 3,500 acre-feet of additional average water supply.
Agricultural production costs and revenues	$780 million in annual crop revenue.	Similar to existing conditions.	Potential cost increases for water use efficiency and water quality BMPs.	Potential cost increases for BMPs. New water supply could support increased production, but is potentially very costly.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.
Risk and uncertainty	Relatively high regulatory uncertainty for areas using water from Delta. Risk to water supply from salinity in Delta.	Similar to existing conditions.	Higher costs could increase financial risk. Potential reduction in regulatory uncertainty. Reduced risk of salinity intrusion into Delta export supplies.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.

NOTES:

BMP = Best management practice.
CVP = Central Valley Project.

Table 10. Summary of Potential Impacts on Agricultural Resources in the Bay Region

Assessment Variable	Existing Conditions	Configurations							
		No Action	Alternative 1		Alternative 2			Alternative 3	
			1A, 1B	1C	2A	2B, 2E	2D	3A	3B, 3E, 3H, 3I
Irrigated acres	1.8 million irrigated acres.	Aggregate shift toward orchards and vegetables in response to consumer demands.	Farmland converted for habitat uses.	Same as 1A. Potential loss of some land for storage and conveyance facilities.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.
Agricultural water use	3.3 MAF of surface water use; 1.4 MAF of groundwater.	Similar to existing conditions.	Potential changes due to water use efficiency and water quality BMPs.	Same as 1A. Also, up to 35,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 10,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 35,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 18,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 15,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 37,000 acre-feet of additional average water supply.
Agricultural production costs and revenues	$1.6 billion in annual crop revenue.	Increased revenue due to crop shifts.	Revenue losses from land conversion. Potential cost increases for water use efficiency and water quality BMPs.	Same as 1A. Also, new water supply could support increased production, but is potentially very costly.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.
Risk and uncertainty	Moderate uncertainty due to water quality regulation and instream flow requirements.	Similar to existing conditions.	Potential reduction in regulatory uncertainty. Higher costs can increase financial risk.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	**Same as 1A.**

NOTES:

BMP = Best management practice.
MAF = Million acre-feet.

T able 11. Summary of Potential Impacts on Agricultural Resources in the Sacramento River Region

Agricultural Economics

BMPs for the water quality and water use efficiency programs could lead to significant impacts (both beneficial and adverse) in land and water use patterns. Adverse impacts would more likely result from costs imposed. Beneficial effects include reduced salinity of irrigation, which could increase yields, reduce production costs, and provide more flexible crop selection.

More carefully monitored application of water can result in substantially increased yields and reduced chemical costs, irrespective of salinity. Lower applied water amounts can adversely affect drain water users (forcing them to search for another source of supply), raise groundwater pumping lifts and impair groundwater storage for conjunctive use.

Implementation of upper watershed enhancements could result in converting agricultural lands adjacent to waterways in order to restore riparian habitat, stabilize stream channels, restore natural stream hydrology, and create a non-point source pollution buffer. Conversion of land from productive use likely would result in a potentially significant adverse impact on net income and public finances, and could result in foregone economic opportunities.

Changes in water supply, such as purchasing water rights for instream flow, could result in changes to cropping patterns and could affect crop value. Direct impacts on the landowner are not considered potentially significant, because water would be purchased only from willing sellers. Changes in the quantity or pattern of instream flow that affect downstream agricultural users could result in potentially significant adverse impacts on these users.

Social Well Being Related to Agriculture

Impacts from implementing the Water Quality Program would be similar to these in the Delta Region.

Water Use Efficiency Program, Including Water Transfers

Agricultural Land Use

Potential water use efficiency and water transfer program impacts would be similar to those discussed under the Delta Region.

Agriculture Economics

The economic impact of the Water Use Efficiency Program is uncertain, and could range from little or no measurable effect to potentially significant reductions in applied water. Based on preliminary estimates prepared for CALFED, costs of achieving efficiency increases could range from $40 to $60 per acre-foot of reduced applied water. Because virtually all applied water losses are recoverable and reusable in the Sacramento River Region, no net savings in consumptive use or irrecoverable loss (that is, "real" water savings) are likely. Additional district-level costs could range from $5 to $12 per acre of land served.

Lower water use on average could leave some districts and users with more carryover water on average, with some net improvement in water supply reliability. Required BMPs also could result in demand hardening, in which fewer inexpensive management options remain for reducing water use during drought.

Any changes in water supply, such as purchase of water rights for in-stream flow, could result in changes to cropping patterns, potentially affecting corp value. Direct impacts to the landowner would not be significant because the transaction would be only with willing sellers. Changes in the quantity or pattern on in-stream flow could affect downstream agricultural users, and could potentially be significant.

The Water Transfer Program would generally have the same beneficial and adverse impacts as identified for the Delta region. Reduced pumping costs due to receiving a water transfer could occur, resulting in a beneficial economic impact.

Potential significant adverse impacts could also occur. Water transfers due to direct groundwater pumping or groundwater substitution could cause a temporal or volumetric increase in groundwater pumping and increased costs associated with exacerbating groundwater overdraft; pumping from lowered groundwater levels; deepening wells; lowering pumps; and redrilling wells. These increased operating costs could reduce irrigated acreage at nearby farms that are not transferring water. Direct groundwater and groundwater substitution transfers could also cause a reduction in surface water flows due to lower water quality; reduce demand for crop storage and processing; reduce demand for farm inputs; lower ground elevations, making affected areas more susceptible to flooding; and reduce habitat supported by surface seepage of groundwater.

Social Well Being Related to Agriculture

The impacts from the water use efficiency and water transfer programs are the same as discussed under the Delta Region. Additional adverse impacts to local groundwater pumping and facility costs could occur under some conditions of direct groundwater transfers or groundwater substitution transfers.

The Water Transfer Program would generally have the same beneficial and adverse impacts as identified for the Delta region. However, other potential significant adverse impacts at the transferred water's origin could occur. Agricultural sector workers' incomes could be reduced due to lowered groundwater levels from their own or others' direct groundwater and groundwater substitution transfers that increase costs to pump groundwater; deepen wells; lower pumps; and redrill wells.

Storage and Conveyance

Alternative 1

Agricultural Land Use

Storage facilities proposed under Configurations 1C, 2B, 2E, 3B, 3E, 3H, and 3I could result in converting agricultural land uses in the foothill or mountain areas, a potentially significant adverse impact. Development of storage facilities could also conflict with local and regional plans regarding agricultural lands.

County general plans in the Sacramento River Region which could be applicable to land use impacts include those of: Butte, Colusa, Glenn, Lake, Lassen, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Solano, Sutter, Tehama, Yolo, and Yuba Counties. Principal local plans include those of the cities of: Chico, Sacramento, Redding, and Davis. The compatibility and consistency of potential actions with county and local land use plans is not evaluated in this programmatic-level analysis. However, inconsistency with these plans could result in a significant adverse land use impact.

Between 18,000 and 32,000 acres of agricultural land could be affected by the program storage elements. But, because storage facility locations have not been chosen, the amount of important farmland affected is not known and will be determined in project-specific environmental documentation.

Because potential storage sites are primarily in the foothills and would affect dryland crops and grasslands, which are reliant on rainfall, applied water has not been estimated.

It is anticipated that agricultural water users in the Sacramento River and San Joaquin River Region would receive some of the additional water supply developed bymost of the configurations, ranging from about 60,000 to 700,000 acre-feet (annual average). However, under Configurations 1A, 1B, 2A, 2D, and 3A, the Sacramento River Region would probably not receive additional water supply benefits.

Agricultural Economics

The likely location of large storage facilities is in foothill or mountain areas, where land use is likely to be non-irrigated grazing. Impacts include permanent conversion and inundation and temporary disruption of agricultural activity during construction. Permanent conversion of

during construction. Permanent conversion of farmland for facilities is a potentially significant impact. Impacts from improvements in water supply reliability are small in the Sacramento River Region.

Configuration 1C could provide an average of up to 35,000 acre-feet of additional supply to Sacramento River Region users. Table 7 summarizes the estimates of yields provided for different alternatives, based on available preliminary hydrologic analysis. Potential beneficiaries in the Sacramento River Region would be primarily CVP contractors, who would use the water to replace groundwater or supply lost from the CVPIA. According to an analysis completed for CVPIA, the direct value of this water to agriculture ranges from $30 to $40 per acre-foot, making it relatively costly.

The willingness of agricultural users to purchase water provided from storage components will depend on its cost. Based on the CVPIA analysis and recent payment capacity analysis by the U.S. Bureau of Reclamation, it is unlikely that Sacramento River Region CVP users would be willing to pay the cost for new water. If the cost of water provided was greater than agriculture's willingness to pay, then the new supply would have no impact on agricultural production. Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., crop selection, water use).

Social Well Being Related to Agriculture

The impacts of additional water supply could include the development of additional acreage for agriculture, increased water supply reliability resulting in greater farm investments, and shifts to higher water use and higher value crops. Other beneficial impacts include development of additional acreage shifted from the Delta due to land conversion, changes to higher water use and higher value crops, and additional farm worker jobs may become available if additional acreage is developed. The extent of this beneficial impact would vary and would be dependent on the ultimate cost of the water.

Alternatives 2 and 3

Agricultural Economics

Changes in water available for delivery due to storage and conveyance components are shown in Table 7, and range from an average of 10,000 acre-feet per year in Configuration 2A to about 35,000 acre-feet per year in Configurations 2B and 2E. Configurations 3B and 3E, 3H, and 3I would provide much larger increases in supply during critical years, improving the overall reliability of irrigation water availability. The delivery areas and the nature of impacts would be similar to those described under Configuration 1C. Some of this water could support acreage shifted out of the Delta Region due to land conversion. If the cost of water provided was greater than agriculture's willingness to pay, then the new supply would have no impact on agricultural production.

Social Well Being Related to Agriculture

Configuration 2A would yield approximately an additional 10,000 acre-feet per year of water for the Sacramento River Region, Configuration 2B – 34,600 acre-feet per year, Configuration 2D – 17,900 acre-feet per year, and Configuration 2E – 34,600 acre-feet per year.

This additional water supply could include the development of additional acreage, increased water supply reliability resulting in greater farm investments, and shifts to higher water use and higher value crops. The extent of this positive impact would vary and depend on the ultimate cost of the water as discussed above for "Agricultural Economics."

Development of storage and conveyance facilities in Configurations 2B, 2D and 2E, depending on their location, could require converting agricultural lands, resulting in a potentially significant impact on some farmers. This impact could be offset by shifting acreage to other parts of the Sacramento River Region.

Impacts on farm workers would depend on new acreage developed by farmers. Configuration 2A likely would result in minimal new jobs; however, Configurations 2B, 2D and 2E could result in a significant number of jobs and a positive impact on the farm worker social group, as well as on associated agricultural businesses.

Configuration 3A would yield about 15,000 acre-feet per year of additional water for the Sacramento River Region; Configurations 3B, 3E, 3H, and 3I would yield about 36,700 acre-feet per year of additional water. Impacts of this additional water supply on farmers, farm workers, and the farm worker social group would be similar to those described for Alternative 2.

SAN JOAQUIN RIVER REGION

Table 12 summarizes impacts on agricultural resources for the San Joaquin River Region.

ALL ALTERNATIVES

Ecosystem Restoration Program

Agricultural Land Use

The ecosystem restoration program could convert up to 11,000 acres of important farmland for habitat restoration in the San Joaquin River Region. These components would affect primarily lands east of the San Joaquin River, and could be a significant adverse land use impact. About half of the land taken out of production would be classified as prime. Conversion of prime farmland is considered a potentially significant impact. In addition, the changes in land use, water use, and employment associated with the reduction in agricultural production are potentially significant.

Agricultural Economics

This program would convert productive farmland in the San Joaquin River Region. Cotton and other row crops, orchards, vineyards, pasture, and hay all potentially would be affected. According to the analysis for the CVPIA Programmatic EIS, overall acreage of orchards, vineyards, and vegetable crops is less affected by water or land purchase. Pasture, hay, rice, cotton, and other field crops are more likely to be affected. Using a range of reasonable crop revenue between $500 and $1,000 per acre per year, the regional reduction in annual crop revenue could range from $25 to $50 million. This would have a substantial adverse economic impact on farm revenues, income generation, and employment levels. Loss of production may also adversely affect the financial viability of local agencies, especially water and reclamation districts.

Any changes in water supply, such as purchase of water rights for in-stream flow, could result in changes to crop patterns, potentially affecting crop value. Direct impacts to the landowner would not be significant because the transaction would be only with willing sellers. Changes in the quantity or pattern of in-stream flow could affect downstream agricultural users and could potentially be significant.

Social Well Being Related to Agriculture

The Ecosystem Restoration Program could result in conversion or idling of agricultural land in the San Joaquin River Region. The impacts would be similar to those described for the Delta Region.

Assessment Variable	Existing Conditions	Configurations							
		No Action	Alternative 1		Alternative 2			Alternative 3	
			1A, 1B	1C	2A	2B, 2E	2D	3A	3B, 3E, 3H, 3I
Irrigated acres	5.2 million irrigated acres.	Aggregate shift toward orchards and vegetables in response to consumer demands.	Farmland converted for habitat uses, primarily on east side.	Same as 1A. Potential loss of some land for storage and conveyance facilities.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.
Agricultural water use	10.3 MAF of surface water use; 1.8 MAF of groundwater.	Similar to existing conditions.	Potential changes due to water use efficiency and water quality BMPs.	Same as 1A. Also, up to 167,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 48,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 167,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 86,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 73,000 acre-feet of additional average water supply.	Same as 1A. Also, up to 177,000 acre-feet of additional average water supply.
Agricultural production costs and revenues	$8.4 billion in annual crop revenue.	Increased revenue due to crop shifts. Groundwater pumping costs likely to increase.	Revenue losses from land conversion. Potential cost increases for water use efficiency and water quality BMPs.	Same as 1A. Also, new water supply could support increased production, but is potentially very costly.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.	Same as 1C.
Risk and uncertainty	Relatively high regulatory uncertainty for areas using water from Delta. Risk to water supply from salinity in Delta.	Similar to existing conditions.	Potential reduction in regulatory uncertainty. Reduced risk of salinity intrusion into Delta export supplies. Higher costs could increase financial risk.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.	Same as 1A.

NOTES:

BMP = Best management practice.
MAF = Million acre-feet.

Table 12. Summary of Potential Impacts on Agricultural Resources in the San Joaquin River Region

Water Quality Program, Including Watershed Management Coordination

Agricultural Land Use

As proposed in the Water Quality Program, approximately 35,000 to 45,000 acres of agricultural land with water quality problems (for example, due to selenium) may be idled in the Grasslands Subarea of the San Joaquin River Region as a measure to improve water quality in the region and the Delta. The location of these lands and, consequently, the types of crops that would be idled are not known. But up to 45,000 acres of agricultural land, including prime and unique farmland, could be affected.

Again, the location and mix of crops that would be retired as part of the Water Quality Program is unknown. But assuming an average of 3 acre-feet of applied water per crop acre and a maximum of 45,000 acres of drainage problem lands idled, approximately 135,000 acre-feet of water would not be applied. As discussed in the Delta Region Land and Water Use impact section, this reduction in applied water does not necessarily equate to new water. Some of this water would likely be recoverable in the San Joaquin River Region by downstream or in-basin users.

Potential watershed activities in the San Joaquin River Region will be compatible with applicable environmental and land use plans and policies in their affected jurisdiction. Reduced grazing activities could also have potential significant land use impacts in this region if they result in a loss of agricultural productivity.

Agricultural Economics

Potential beneficiaries in the Sacramento River Region would be primarily CVP contractors, who would use the water to replace groundwater or supply lost from the CVPIA. According to an analysis completed for CVPIA, the direct value of this water to agriculture ranges from $30 to $40 per acre-foot, making it relatively costly. Depending on costs and options for cost-sharing associated with the Water Quality Program, impacts on agricultural land and water use in the San Joaquin River Region could be potentially significant.

Salinity of water diverted from the Delta for use in the San Joaquin Valley is estimated using the Tracy Pumping Plant Intake as the measurement location. As seen in Table 4, average salinity ranges from 278 ppm in the No Action Alternative to a low of 127 ppm in Alternative 3D. The highest salinity months range from 366 ppm to No Action down to 177 ppm in Alternative 3D. Soil salinity associated with these average values would range from 0.30 to 0.65. The highest salinity is estimated in the No Action Alternative, and the lowest in Alternative 3. Some areas receiving water from the Delta also have poor drainage, and some areas apply a mixture of groundwater and surface water. Therefore, the improvements to water quality, especially in Alternative 3, are potentially large enough to have some effect on crop selection, water management, and yields, and could provide a potentially significant benefit.

These estimates account for water quality changes due to water supply, conveyance, and operations changes. Impacts associated with the Water Quality Program and the Water Use Efficiency Program could potentially affect agricultural users, but the size and direction of these impacts in unclear. No estimates of changes in water quality for irrigation have been made for the Sacramento River Region.

Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (such as, crop selection, water use).

Retirement of lands with water quality problems in the San Joaquin River Region would have a significant adverse impact on jobs similar in magnitude to the impact of the Ecosystem Restoration Program land conversion in the San Joaquin River Region.

Impacts associated with upper watershed enhancements would be similar to those described for the Sacramento River Region.

Social Well Being Related to Agriculture

Retirement of lands with water quality problems in the San Joaquin River Region would have a significant adverse impact on jobs similar in magnitude to the impact of the Ecosystem Restoration Program land conversion in the San Joaquin River Region.

Water Use Efficiency Program, Including Water Transfers

Agricultural Land Use

Potential water use efficiency program and water transfer program impacts would be similar to those discussed under the Delta Region.

Agricultural Economics

The impact of the Water Use Efficiency Program is uncertain and could range from little or no measurable effect to potentially significant reductions in applied water. Based on preliminary estimates prepared for CALFED, costs of achieving efficiency increases could range from $50 to $100 per acre-foot of reduced applied water, but over $500 per acre-foot of net savings in consumptive use or irrecoverable loss (that is, "real" water savings). Additional district-level costs could range from $5 to $12 per acre of land served.

Lower water use on average could leave some districts and users with more carryover water on average, with some net improvement in water supply reliability. Required BMPs could also result in demand hardening, in which fewer inexpensive management options remain for reducing water use during drought.

Any changes in water supply, such as purchase of water rights for in-stream flow, could result in changes to cropping patterns, potentially affecting corp value. Direct impacts to the landowner would not be significant because the transaction would be only with willing sellers. Changes in the quantity or pattern on in-stream flow could affect downstream agricultural users, and could potentially be significant.

The Water Transfer Program would generally have the same beneficial and adverse impacts as identified for the Delta region. However, another potential significant beneficial impact of reduced pumping costs due to receiving a water transfer could occur. Similarly, other potential significant adverse impacts could occur. Water transfers due to direct groundwater pumping or groundwater substitution could cause a temporal or volumetric increase in groundwater pumping and increased costs associated with exacerbating groundwater overdraft; pumping from lowered groundwater levels; deepening wells; lowering pumps; and redrilling wells. These increased operating costs could reduce irrigated acreage at nearby farms that are not transferring water. Direct groundwater and groundwater substitution transfers could also cause a reduction in surface water flows due to induced seepage; reduce crop yields due to lower water quality; reduce demand for crop storage and processing; reduce demand for farm inputs; lower ground elevations, making affected areas more susceptible to flooding; and reduce habitat supported by surface seepage of groundwater.

Social Well Being Related to Agriculture

The impacts from the water use efficiency and water transfer programs would be the same as those discussed under the Sacramento Region.

Storage and Conveyance

Alternative 1

Agricultural Land Use

Storage and conveyance facilities proposed under Configuration 1C could result in conversion of agricultural land, a potentially significant adverse impact.

County general plans in the San Joaquin River Region which could be applicable to land use impacts of the CALFED alternatives include

those of: Amador, Calaveras, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, Tuolumne, and Tulare Counties. Principal local plans include those of the cities of: Fresno, Bakersfield, Stockton, and Modesto. The compatibility and consistency of potential CALFED actions with these plans is not evaluated in this programmatic-level analysis. However, inconsistency between applicable Configuration 1C program elements with these plans could result in a significant adverse land use impact.

Prime and unique farmland could be affected by program elements of the Alternative 1 configurations.

Agricultural Economics

Agricultural lands could be affected by the location of storage and conveyance facilities in the San Joaquin River Region. The likely location of large storage facilities is in foothill or mountain areas, where land use is likely to be non-irrigated grazing. Impacts include permanent conversion and inundation and temporary disruption of agricultural activity during construction. Permanent conversion of farmland for facilities is a potentially significant impact.

Configuration 1C would provide an average of up to 167,000 acre-feet per year of additional supply to San Joaquin Valley users. Table 7 summarizes the estimates of yields provided for different alternatives to different regions, based on available preliminary hydrologic analysis. Agricultural delivery areas for this water would be the Delta-Mendota and San Luis service areas of the CVP, and the Tulare Lake and Kern County regions of SWP delivery. Based on previous studies, it is expected that this water would be used to reduce annual groundwater overdraft, to increase in-stream flows, to support production on lands idled due to supply restrictions of the CVPIA, the Bay-Delta Accord, and for agricultural production. Some of this water also could support acreage shifted out of the Delta Region due to land conversion. Up to one-third of the yield from the storage components of Configuration 1C could be used to provide water for instream flow. Depending on the location of the storage, some of this water could reduce the need to purchase water from agricultural users in the San Joaquin River Region.

The willingness of agricultural users to purchase water provided from storage components will depend on its cost, which is undetermined at this time. If the cost of water provided was greater than agriculture's willingness to pay, impacts of Configuration 1C would be similar to those described for Configurations 1A and 1B. Based on the analysis for the CVPIA Programmatic EIS, the marginal value of this water for agricultural production is $60 to $100 per acre-foot.

Agriculture in the San Joaquin Valley has faced an extended period of long-term uncertainty associated with water allocations as a result of Biological Opinions, water quality concerns, and the CVPIA. To the extent that CALFED actions could resolve many environmental concerns and reduce the threat of future regulatory action, long-term water supply uncertainty would be reduced. The concept of adaptive management implies that long-term or short-term export and delivery rules may change over time as new information is obtained. Changes can increase or decrease total water deliveries, but the possibility of rule changes imposes uncertainty. It is possible that this uncertainty would be less than that faced by agricultural water users under existing conditions or No Action Alternative conditions.

Social Well Being Related to Agriculture

In the San Joaquin River Region, Configuration 1C would provide an average of up to 166,700 acre-feet per year of additional water supply. Impacts of this additional water supply could include the development of additional acreage, increased water supply reliability resulting in greater farm investments, and shifts to higher water use and higher value crops. A significant number of jobs for farm workers and agribusiness could become available if additional acreage or higher labor demand crops were developed.

Alternatives 2 and 3

Agricultural Land Use

As discussed for Alternative 1, development of the storage and conveyance facilities, depending on the location, could require converting some agricultural lands, resulting in a potentially significant impact to some farmers. This impact could be offset by shifting acreage to other parts of the San Joaquin River Region.

Impacts from storage facilities under Alternatives 2 and 3 would be similar to those described under Configuration 1C.

Agricultural Economics

Changes in water available for delivery due to storage and conveyance components are shown in Table 7, and range from an average of 48,000 acre-feet per year in Configuration 2A to about 167,000 acre-feet per year in Configurations 2B and 2E. Configurations 3B and 3E, 3H, and 3I would provide much larger increases in supply during critical years, improving the overall reliability of irrigation water availability. The delivery areas and the nature of impacts would be similar to those described under Configuration 1C. Some of this water could support acreage shifted out of the Delta Region due to land conversion. The marginal value of this water for agricultural production is estimated to be $60 to $100 per acre-foot. If the cost of water provided is greater than agriculture's willingness to pay, impacts of Alternative 2 in the San Joaquin River Region would be similar to those described for Configurations 1A and 1B.

Configuration 2A would yield approximately 48,300 additional acre-feet per year of water for the San Joaquin River Region, Configurations 2B and 2 – 166,700 acre-feet per year, and Configuration 2D – 86,100 acre-feet per year. Impacts of this additional water supply could include the development of additional acreage, increased water supply reliability resulting in greater farm investments, and shifts to higher water use and higher value crops. The extent of this positive impact would vary and depends on the ultimate cost of the water as discussed above for Alternative 1.

Social Well Being Related to Agriculture

Configuration 2A would provide an additional 48,300 acre-feet per year of water for the San Joaquin River Region, Configurations 2B and 2E would provide about 166,700 acre-feet per year, and Configuration 2D would provide about 86,100 acre-feet per year. Configuration 3A would provide an additional 72,500 acre-feet per year of water for the San Joaquin River Region, and Configurations 3B, 3E, 3H and 3I would provide about 177,200 acre-feet per year. The impacts of this additional water supply could include the development of additional acreage, increased water supply reliability, resulting in greater farm investments, and shifts to higher water use and higher value crops. A significant amount of jobs could become available if additional acreage or higher labor demand crops were developed.

Development of the storage and conveyance facilities in Configurations 2A, 2B, 2D, 2E, 3A, 3E, 3H, and 3I depending on the location, could require the conversion of agricultural lands resulting in a potentially significant impact to farmers. This impact could be offset by shifting acreage to other parts of the San Joaquin River Region.

Impacts to farm workers would depend on new agricultural acreage developed by farmers. Configurations 2A and 3A would likely result in several new jobs. Configurations 2B, 2D, 2E, 3B, 3E, 3H and 3I could result in a significant number of jobs and a beneficial impact to farm workers as well as associated agricultural business.

SWP AND CVP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY

Table 13 summarizes impacts on agricultural resources for the SWP and CVP Service Areas Outside the Central Valley.

Assessment Variable	Existing Conditions	Configurations			
		No Action	Alternative 1	Alternative 2	Alternative 3
			1A, 1B, 1C	2A, 2B, 2D, 2E	3A, 3B, 3E, 3H, 3I
Irrigated acres	1.5 million irrigated acres (includes areas not served by CVP and SWP).	Substantial conversion of land to urban use.	Similar to No Action, with minor potential shift of crop production from Delta Region.	Same as Alternative 1.	Same as Alternative 1.
Agricultural water use	340,000 acre-feet of surface water use; 230,000 acre-feet of groundwater (in the SWP service area).	Similar to existing conditions.	Potential changes due to water use efficiency and water quality BMPs.	Same as Alternative 1.	Same as Alternative 1.
Agricultural production costs and revenues	$3.4 billion in annual crop revenue (includes areas not served by CVP and SWP).	Similar to existing conditions.	Potential cost increases for water use efficiency and water quality BMPs.	Same as Alternative 1.	Same as Alternative 1.
Risk and uncertainty	Relatively high regulatory uncertainty for areas using water from Delta. Risk to water supply from salinity in Delta.	Similar to existing conditions.	Higher costs can increase financial risk. Potential reduction in regulatory uncertainty. Reduced risk of salinity intrusion into Delta export supplies.	Same as Alternative 1.	Same as Alternative 1.

NOTES:

BMP = Best management practice.
CVP = Central Valley Project.
SWP = State Water Project.

Table 13. Summary of Potential Impacts in the SWP and CVP Services Areas Outside the Central Valley

ALL ALTERNATIVES

Agricultural Land Use

Potential direct land use impacts to agricultural land in the SWP and CVP Service Areas Outside the Central Valley are anticipated to be minimal and have not been quantified.

It is anticipated that agricultural water users in this region would receive some of the additional water supply developed by most of the configurations, ranging from about 60,000 to 700,000 acre-feet (annual average).

County general plans in CVP and SWP Service Areas outside the Central Valley which could be applicable to land use impacts include those of: Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura Counties. Principal local plans include those of the cities of: Los Angeles, Anaheim, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura. The compatibility and consistency of potential actions with these plans is not evaluated in this programmatic-level analysis. However, inconsistency between alternative configurations and with these plans could result in a significant adverse land use impact.

Indirect changes in land use may result from the Water Use Efficiency Program. In some instances, agricultural land may be removed from production because of increased costs and decreased profitability which could result from required efficiency improvements or increased district water charges (for example, as part of tiered water pricing). Conversely, improved efficiency may allow the continued viability of agriculture in some areas. This will tend to maintain the existing uses of agricultural lands in some regions and reduce the amount that may go out of production or become urbanized. Efficiency improvements that result in greater water supply reliability but also higher annual cost may cause a shift in the types of crops grown. Conversion or loss of agricultural land would be a potentially significant adverse land use impact of the program. Improvement in the long-term viability of some agricultural lands would be a potential beneficial impact.

Agricultural Economics

Impacts on agriculture in this region are expected to be small. Potential cost impacts from the water quality and water use efficiency programs may occur if BMPs are applied to areas outside the Central Valley. Salinity intrusion benefits of the levee system integrity program would also be felt in this region.

Substantial conversion of agricultural land in the Delta Region could shift some production to desert areas in Southern California, such as the Imperial Valley. Additional water would be available to SWP contractors in the South Coast and Central Coast areas. However, it is unlikely that a significant amount of this water would be delivered for irrigation use.

SWP water delivered for irrigation in Southern California would have the same quality changes as described for the San Joaquin River Region. Relatively little SWP water pumped into Southern California is used for irrigation, and some of that gets mixed with other local water sources. The aggregate impact on agriculture in these areas is potentially beneficial but probably not significant.

Potential charges imposed on agricultural water use to recover costs of program components could lead to significant changes in agricultural activities (e.g., crop selection, water use).

The Water Transfer Program benefits are related to the increased agricultural production, incomes, and employment opportunities associated with any transfer that uses the water for agricultural production outside of the Central Valley.

The upper watersheds in the SWP and CVP Service Areas Outside the Central Valley were excluded from this report because no CALFED upper watershed activities are proposed in these areas.

Social Well Being Related to Agriculture

Impacts on agriculture in this region are expected to be small. Substantial conversion of agricultural land in the Delta Region could shift some production to desert areas in Southern California, such as the Imperial Valley. The Water Transfer Program would increase agricultural production, incomes, and employment opportunities associated with any transfer that uses the water for agricultural production outside of the Central Valley. The net change in jobs is expected to be minimal, with only minor effects on community stability.

The addition of water from the Water Transfer Program could promote growth in affected areas of Southern California. The lack of water in many of these areas currently limits growth potential. Additional water supplies could allow more production and consumption, leading to growth. This would benefit the local economies, but may result in long-term adverse impacts if the water transfers were terminated.

Comparison of CALFED Alternatives to Existing Conditions

AGRICULTURAL LAND USE

Comparison of Program alternatives to existing conditions indicates:

- All significant adverse impacts identified when making a comparison to the No Action Alternative would still be significant when compared to existing conditions.
- CALFED is proposing actions for levee protection, storage and conveyance, and ecosystem restoration, which could result in additional large-scale land conversions impacting agricultural lands, particularly in the Delta. Adverse impacts resulting from the CALFED alternatives combined with the expected future conversion of agricultural lands when compared to existing conditions.
- The water supply reliability actions from the Water Use Efficiency, Water Quality, and Storage and Conveyance programs could improve the availability and quality of water for agricultural purposes above the existing conditions baseline. While CALFED is expecting an overall improvement in water supply reliability for agriculture relative to the No Action Alternative, there is still the potential that the benefits provided by the Program alternatives could be diminished by unforeseen future conditions such as extended drought. Consequently, while the benefits of the alternatives were analyzed using reasonable approximations of future conditions, it should be acknowledged that water supply reliability could be worse than currently exists.

In summary, the conclusions regarding the significance of project effects on surface water quality when compared to existing conditions would be similar to those compared to No Action.

AGRICULTURAL ECONOMICS

Comparison of Program alternatives to existing conditions indicates:

- All significant adverse impacts identified when making a comparison to the No Action Alternative would still be significant when compared to existing conditions.
- CALFED is proposing actions for levee protection, storage and conveyance, and ecosystem restoration, which could result in additional large-scale land conversions impacting agricultural lands, particularly in the Delta. Adverse impacts resulting from the CALFED alternatives combined with the expected future conversion of agricultural lands when compared to existing conditions.

- The water supply reliability actions from the Water Use Efficiency, Water Quality, and Storage and Conveyance programs could improve the availability and quality of water for agricultural purposes above the existing conditions baseline. While CALFED is expecting an overall improvement in water supply reliability for agriculture relative to the No Action Alternative, there is still the potential that the benefits provided by the Program alternatives could be diminished by unforeseen future conditions such as extended drought. Consequently, while the benefits of the alternatives were analyzed using reasonable approximations of future conditions, it should be acknowledged that water supply reliability could be worse than currently exists.

SOCIAL WELL BEING RELATED TO AGRICULTURE

Comparison of Program alternatives to existing conditions indicates that:

- Under the No Action Alternative, economic conditions are expected to be similar to those for existing conditions with the exception of costs for irrigation water.

- Because of the uncertainty over the magnitude of future water costs under the No Action Alternative, it is difficult to predict whether cost of agricultural water relative to existing conditions will be higher or lower than what is expected under the No Action Alternative, but it is unlikely that water costs would be less expensive. Where water costs are lower than No Action but higher than existing conditions, this could result in a new significant impact when compared to existing conditions. If water costs are higher than those under the No Action Alternative, this would be an adverse impact of greater magnitude when compared to existing conditions.

MITIGATION STRATEGIES

Agricultural Land Use

Mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific projects are approved by subsequent environmental review.

Avoidance or minimization strategies:

- Develop assurance measures to increase water supply reliability such as providing long-term water supply contracts;

- Site and align Program features to avoid or minimize impacts on agriculture;

- Examine structural and nonstructural alternatives to achieving project goals without impacting agricultural lands;

- Implement features that are consistent with local and regional land use plans;

- Work with local and regional jurisdictions to amend local plans and policies to bring Program features into compliance;

- Involve all affected parties, especially landowners and local communities in developing appropriate configurations to achieve the optimal balance between resource impacts and benefits;

- To the extent practicable, maintain the productivity and flexibility of California's agricultural resources.

Some examples of Ecosystem Restoration Program avoidance or minimization measures are:

- Restore existing degraded habitat first;

- Focus habitat restoration efforts first on developing new habitat on public lands;

- Absent public lands, restoration efforts will occur on lands acquired from willing sellers where at least part of the reason to sell is an economic hardship, that is, land that floods frequently or the levees are too expensive to maintain;

- Where small parcels of land are needed for waterside habitat, acquisition efforts will seek out points of land on islands where the ratio of levee miles to acres farmed is high;

- Obtain easements on existing agricultural land which would allow for minor changes in agricultural practices thus increasing the value of the agricultural crop(s) to wildlife;

- Floodplain restoration efforts would include provisions for continued agricultural practices on an annual basis;

- Water acquired for habitat purposes could be purchased using temporary or rotating contracts so that the same land or locality is not impacted every year; and

- Use a planned or phased habitat development approach in concert with adaptive management.

Some examples of avoidance and minimization measures from the Levee System Integrity Program include:

- In implementing levee reconstruction measures, work with landowners to establish levee reconstruction methods which avoid or minimize the taking of agricultural land;

- When planning subsidence control measures, work with landowners to establish Best Management Practices (BMPs) which avoid or minimize changing land use practices while protecting levees from the effects of subsidence. Through adaptive management, modify BMPs to further reduce impacts to agricultural land;

- Protection of other agricultural land of equivalent productive potential for agricultural use without restrictions. This could be accomplished via easements;

- Implementation of erosion control measures to the extent possible during and after project construction activities. These erosion control measures can include grading the site to avoid acceleration and concentration of overland flows, using silt fences or hay bales to trap sediment, and revegetating areas with native riparian plants and wet meadow grasses;

- Protect exposed soils with mulches, geotextiles, and vegetative ground covers to the extent possible during and after project construction activities to minimize soil loss;

- Schedule construction activities in a manner so that current crops may be harvested prior to construction initiation;

- Develop agricultural infrastructure, buffers and other tangible support for remaining agricultural lands. These buffers should have vegetation compatible with farming and habitat objectives; and

- The CALFED benefits of water supply reliability should be provided to agricultural water users on an equitable basis considering the nature and extent of impacts to agricultural resources, including land and water.

Agricultural Economics

As discussed in the introduction to this summary, mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific projects are approved by subsequent environmental review.

Strategies to minimize economic consequences include:

- Provide advice on how to stretch existing water supplies in cost-effective ways to keep water acquisition costs down;
- Provide advice on ways to increase the production yielded from a unit of water (through measures such as improvement in distribution uniformity), which will tend to keep production up even as acreage goes down;
- Provide cost-sharing and other financial assistance to reduce the indirect impacts potentially resulting from the cost of the Water Use Efficiency and Water Quality programs;
- Purchase water acquired for habitat purposes using temporary or rotating contracts so that the same land or locality is not impacted every year;
- Continue the flow of property tax revenues to the local counties, providing opportunities for alternative industries to develop (that is, recreation) and other economic incentives;
- Implement financial incentives to increase wildlife forage on agricultural lands (pay for inefficient harvest methods). Reduce unit charges for water when a farmer implements measures to control discharge of contaminants in excess of regulatory requirements;
- Alter water delivery schedules during shortages to reward farmers who implement measures to control discharge of contaminants in excess of regulatory requirements;
- Create a loan program to support construction of agricultural pollution control facilities;
- Provide technical assistance to farmers wishing to install pollution control facilities;
- Develop assurance measures to increase water supply reliability such as providing long-term water supply contracts;
- Create tax incentives for long-term agricultural zoning;
- Provide technical and financial assistance to develop a regional solution to the San Joaquin Valley drainage problem;
- Schedule construction activities in a manner so that current crops may be harvested prior to construction initiation;
- Pay fair market value for any crops destroyed or taken out of production on private or leased lands as a result of project construction;
- Compensate property owners for the value of their land and associated improvements, including dwelling units, in compliance with state regulations for providing relocation assistance to displaced persons or businesses; and
- Avoid fallowing or shifting crops that require high input and output expenditures.

Social Well Being Related to Agriculture

As discussed in the introduction to this summary, mitigations are proposed as strategies in this programmatic document and are conceptual in nature. Final mitigations would need to be approved by responsible agencies as specific projects are approved by subsequent environmental review.

Strategies for minimizing the social/employment impacts as a result of agricultural land conversion include:

- Continuing the flow of property tax revenues to the local counties, providing opportunities for alternative industries to develop (that is, recreation) and other economic incentives, relocating facilities and shifting agriculture to new areas;

- Compensate local governments for increased demand for services resulting from labor displacement, compensate workers displaced by specific transfers through such actions as augmenting unemployment insurance benefits;
- Provide training and educational opportunities for unemployed individuals to reenter the workforce, job referral and placement services, and job retraining;
- Implement cost-sharing and other financial assistance to reduce the social/employment impacts potentially resulting from the cost of the Water Use Efficiency and Water Quality programs;
- Schedule construction activities in a manner so that current crops may be harvested prior to construction initiation;
- Pay fair market value for any crops destroyed or taken out of production on private or leased lands as a result of project construction; and
- Limit the amount of acreage that can be fallowed in a given area.

POTENTIALLY SIGNIFICANT UNAVOIDABLE IMPACTS

Agricultural Land Use

Program actions associated with the Ecosystem Restoration, Levee System Integrity, and Water Quality programs, or storage and conveyance components could convert existing agricultural uses, including prime and unique farmland. Locally implemented water transfers could also convert existing agricultural land uses to other land uses, though not specifically CALFED Program uses.

Agricultural Economics

Unavoidable impacts to agricultural economics that have the greatest potential to be significant are loss of prime farmland to other uses, such as for habitat or levee setbacks. These impacts would be both direct, such as loss of farm revenue and production opportunities, and indirect, such as less labor demand and reduced farm spending for goods and services.

Social Well Being Related to Agriculture

Farm worker job loss may result in adverse unavoidable impacts. In some cases jobs may be shifted to other areas; however, jobs also may be eliminated with no replacement. This would represent a significant unavoidable impact of the CALFED program.

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